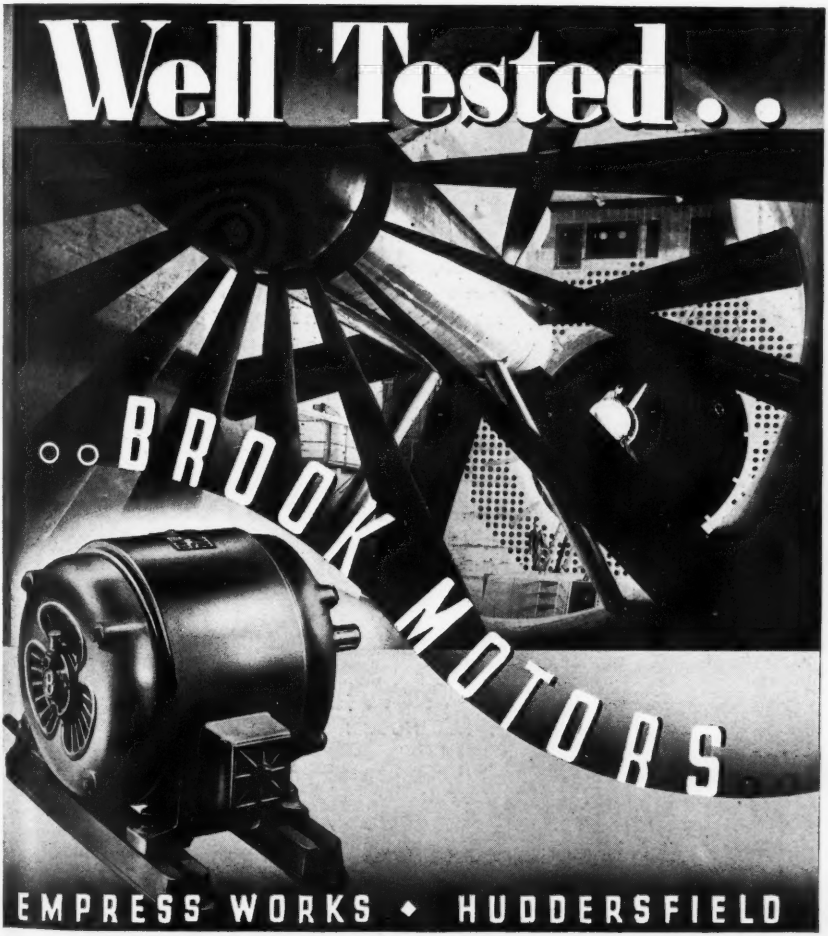
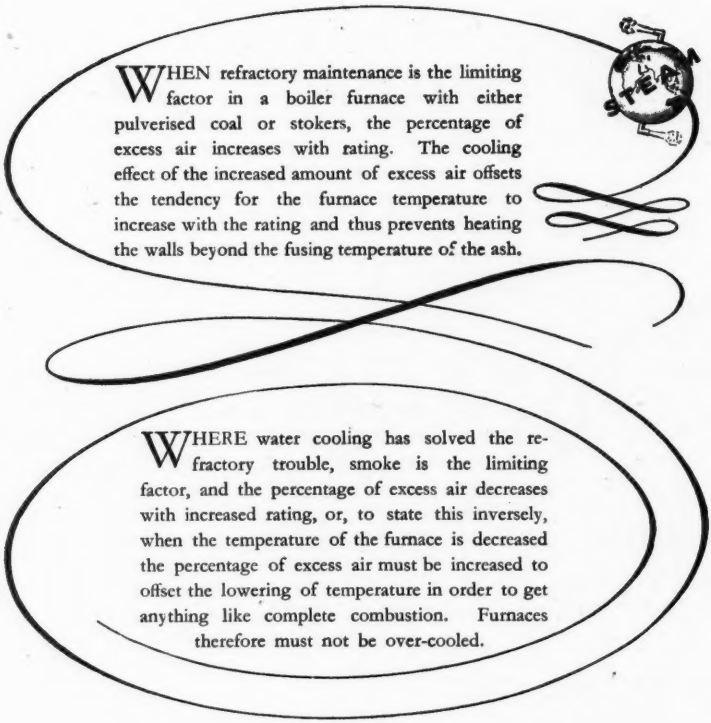
TECHNOLOGY DEPT.
ELECTRICAL REVIEW, AUGUST 7TH, 1942

ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3376. AUGUST 7, 1942 6d. WEEKLY





WHEN refractory maintenance is the limiting factor in a boiler furnace with either pulverised coal or stokers, the percentage of excess air increases with rating. The cooling effect of the increased amount of excess air offsets the tendency for the furnace temperature to increase with the rating and thus prevents heating the walls beyond the fusing temperature of the ash.

WHERE water cooling has solved the refractory trouble, smoke is the limiting factor, and the percentage of excess air decreases with increased rating, or, to state this inversely, when the temperature of the furnace is decreased the percentage of excess air must be increased to offset the lowering of temperature in order to get anything like complete combustion. Furnaces therefore must not be over-cooled.

BABCOCK & WILCOX, LTD

BABCOCK HOUSE, FARRINGDON ST., LONDON, E.C.4

HEATRAE

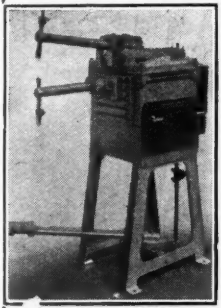
ELECTRIC WATER HEATERS

It was Francis Thompson who said that "All the Past, read True, is Prophecy." The progress of Heatrae in the past—and at present—seems to indicate the Poet's assertion.

HEATRAE LTD NORWICH · GRAMS "HEATRAE" NORWICH · PHONE: NORWICH 25131

WE MAKE

ELECTRIC WELDING MACHINES



11 kVA Spot Welder

SPOT, SEAM AND BUTT WELDERS

35 years' experience

Automatic or Non-Automatic
With or without Electric Control

The quickest and most economical method of Welding Oil Drums, Bars, Tyres, Wheel Rims, Tubes and Angles.

The WESTMINSTER ENG. Co. Ltd.

Victoria Road, Willesden Junction, N.W.10

Dynamos, Motors, Alternators and Transformers Rewound and Re-constructed. "Westminster" Brush Holders. Process Arc Lamps

Telephone: Willesden 1700-1

Telegrams: "Regency, Phone, London."

TAG TERMINALS

FOR WIRELESS AND SIMILAR CONNECTIONS

A WIDE RANGE OF SIZES IN STOCK

ROSS COURTNEY & Co. Ltd.

ASHBROOK ROAD, LONDON, N.19

LINKS

to the specific requirements of our customers.

Makers of all types of repetition products from the bar in all metals.

M·C·L and REPETITION LTD. Pool Lane, Langley, B'ham.

ELECTRIC MOTOR POLISHERS

A. C. 4 BEARINGS
400 VOLTS, 3 PHASE
50 CYCLES.
1, 2, 3, 4 AND 5 H.P.

DELIVERY—
IMMEDIATELY ON
RECEIPT OF MACHINE
TOOL LICENCE AND
CONTRACT NUMBER

for IMMEDIATE DELIVERY!!

W. CANNING & CO. LTD
GREAT HAMPTON STREET
BIRMINGHAM 18

SIEMENS PRODUCTS

MADE IN ENGLAND

Contractors for the manufacture, laying and maintenance of Submarine and Land Cables for Telegraphy. Telephony and the Electric Transmission of Power, for the erection and maintenance of Overland Telegraph, Telephone and Power Transmission Lines, Public and Private Telephone Exchanges and Carrier Equipment for Telephone Lines.

Backed by over 80 years experience!

ELECTRIC WIRES & CABLES

CABLE JOINT BOXES

TELEPHONE CABLES
Aerial, Underground, Submarine

OVERHEAD LINE MATERIAL

CELLS & BATTERIES
Dry, Fluid & Inert

MARINE APPARATUS

ELECTRIC LAMPS

PRIVATE TELEPHONE SYSTEMS

PUBLIC TELEPHONE EXCHANGES

ELECTRIC TOTALISATORS

MEASURING & RECORDING INSTRUMENTS

ELECTRICITY METERS

SIEMENS BROTHERS & Co., LTD

WOOLWICH, LONDON, S.E.18

ESTABLISHED 1858

Telephone: WOOLWICH 2020

A GLOWING TRIBUTE!

nearly 3/4 million

says Mr. RED RING

RADIANT *Red Ring* BOILING PLATES

already supplied

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
TRAFFORD PARK MANCHESTER

L/C201

COSMOS LAMPS *Metrovick's 'light' product*

PANEL SWITCHBOARDS

BTH products include all kinds of electric plant and equipment.

BTH

THE BRITISH THOMSON-HOUSTON CO., LTD.
CROWN HOUSE, ALDWYCH, LONDON, W.C.2.

A3258N

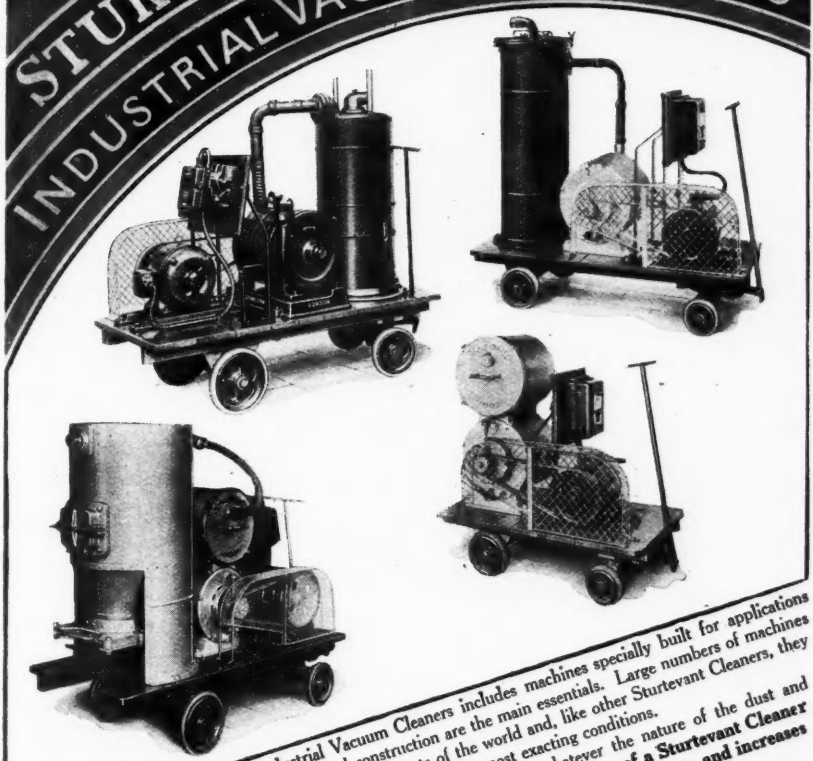
Specify and use—

CABLES that carry confidence as well as current!

PIRELLI GENERAL
RUBBER INSULATED
Cables
Made at Pirelli-General Cable Works.

Get it from the G.E.C.

STURTEVANT INDUSTRIAL VACUUM CLEANING



THE extensive range of Sturtevant Industrial Vacuum Cleaners includes machines specially built for applications where heavy cleaning capacity and substantial construction are the main essentials. Large numbers of machines are successfully operating in all kinds of factories in all parts of the world and, like other Sturtevant Cleaners, they give continuous service and maintain the highest efficiency under the most exacting conditions.

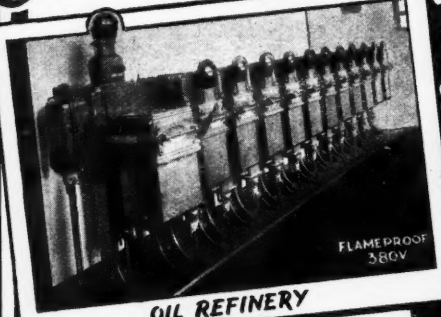
Wherever there is dust and dirt there is a need for a Sturtevant Cleaner for, whatever the nature of the dust and the conditions, **experience shows that the systematic and regular use of a Sturtevant Cleaner overcomes dust problems, effects a reduction in maintenance costs, and increases the efficiency of all cleaning operations.**

Full particulars of Sturtevant Industrial Vacuum Cleaners are given in our post-free publication U.1391. *May we send you a copy?*

STURTEVANT ENGINEERING CO. LTD.
25. WORCESTER ROAD, SUTTON, SURREY.

Some examples of

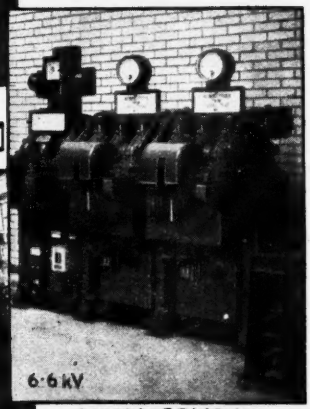
REYROLLE INDUSTRIAL SWITCHGEAR



OIL REFINERY

Originators of Metal-Clad Draw-out Switchgear 1906

CHEMICAL WORKS



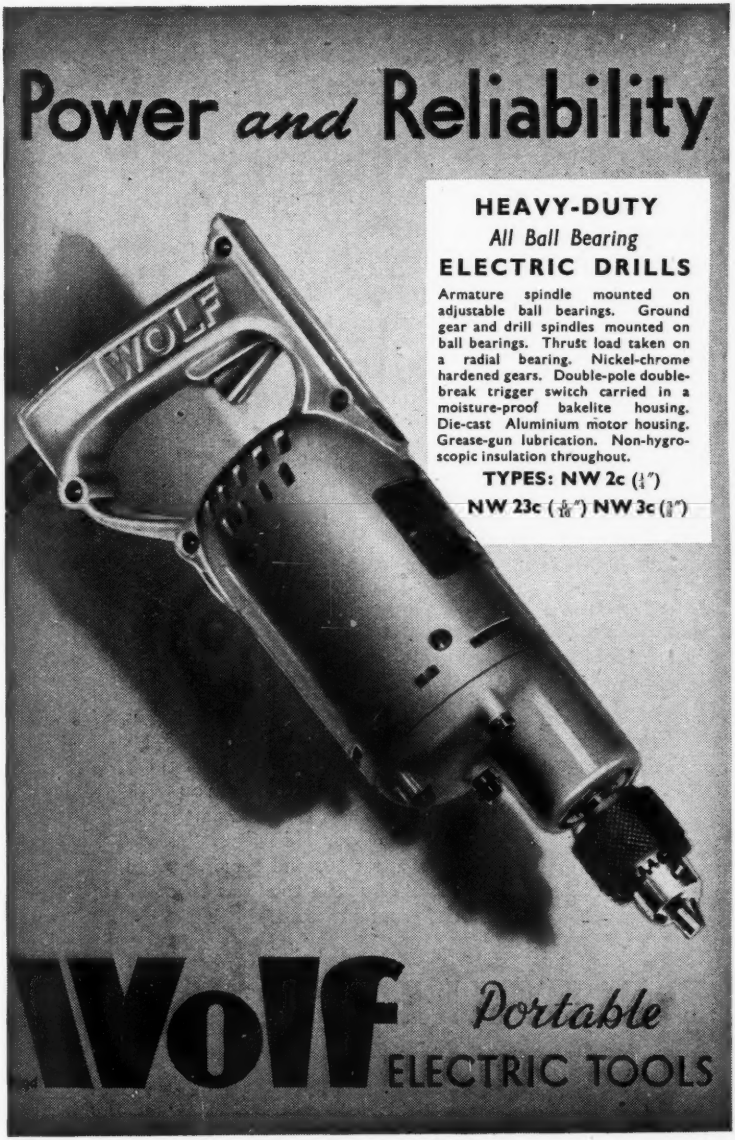
AIRCRAFT FACTORY

ICE FACTORY

REYROLLE

HEBBURN-ON-TYNE ENGLAND

Power *and* Reliability



HEAVY-DUTY
All Ball Bearing
ELECTRIC DRILLS

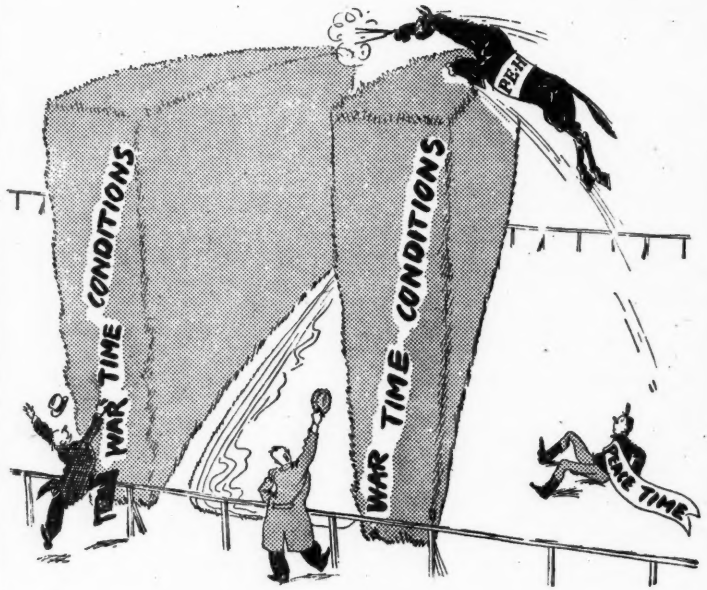
Armature spindle mounted on adjustable ball bearings. Ground gear and drill spindles mounted on ball bearings. Thrust load taken on a radial bearing. Nickel-chrome hardened gears. Double-pole double-break trigger switch carried in a moisture-proof bakelite housing. Die-cast Aluminium motor housing. Grease-gun lubrication. Non-hygroscopic insulation throughout.

TYPES: NW 2c (¼") NW 23c (5/16") NW 3c (⅜")

Wolf *Portable* ELECTRIC TOOLS

S. WOLF & CO., LTD., PIONEER WORKS, HANGER LANE, EALING, W.5. PERivale 5631-3

4892



Don't think we're not trying . . .

When you call on us for a little service don't think we're not trying if we can't do just *what* you want *when* you want it. If you knew the total amount of service we are *still* giving our old friends (by way of limited supplies of apparatus and repairs) you'd probably be surprised. But the total has to cover a lot of ground these days.

PREMIER *Fine-Quality*

electric heating appliances, including the famous "Laundwell" and "Smoothwell" electric irons; "Quickset" and "Pylon" electric kettles; electric fires; toasters; coffee percolators; multi-boilers, glue-pots and other appliances.

PREMIER ELECTRIC HEATERS LIMITED · BIRMINGHAM, 9

COMPACT

CORRECT

FH80

FERRANTI

Polyphase METERS

FERRANTI LTD., Hollinwood, LANCS. *London Office: Bush House, Aldwych, W.C.2.*

'BELLING' ELECTRIC FIRES AND COOKERS

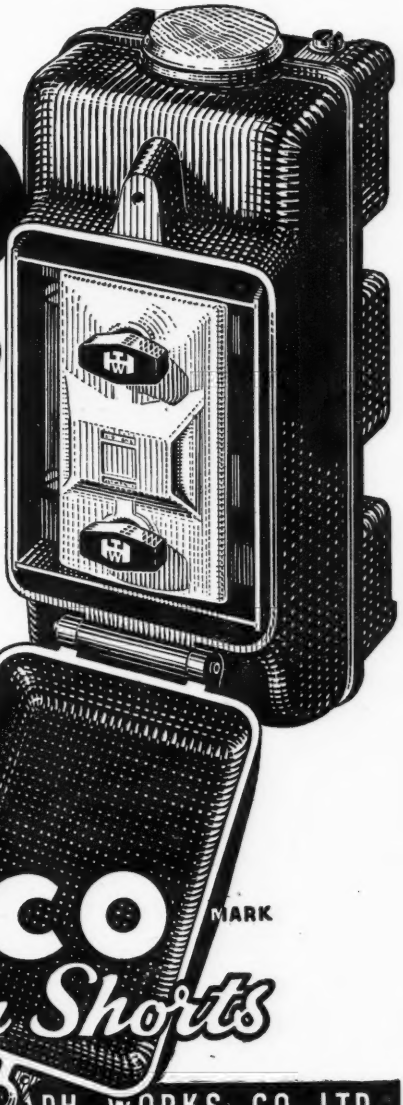
Available only for essential war purposes

'Belling'

BELLING & CO. LTD., BRIDGE WORKS, ENFIELD, MIDDLESEX • 'Phone: HOWARD 1212

C.R.C. 315

for 500 amps



Here is the latest addition to the range of ISCO Ironclad Service Fuses. The general design is similar to that of the 200 amp. and 300 amp. single pole ISCOS.

Henley patent Wedge type Cartridge Fuses ($3\frac{5}{8}$" fixing centres) or Henley patent Wedge type Links can be fitted as required.

Full details on request.

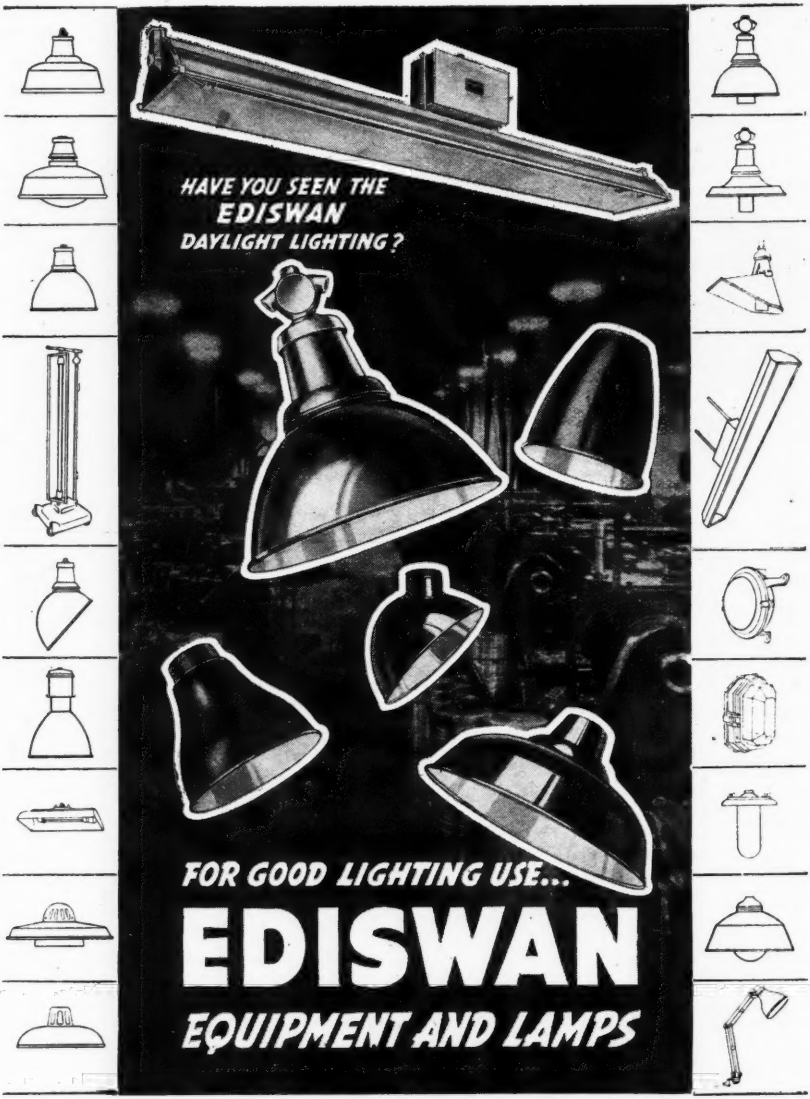
TRADE ISCO MARK

Safe on Shorts

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

MILTON COURT · WESTCOTT · DORKING · SURREY

PHONE: DORKING 3241 (10 LINES)
TELEGRAMS: HENLETEL, DORKING



LET EDISWAN SOLVE YOUR LIGHTING PROBLEMS

Apply for Ediswan "Industra" Lighting Catalogue and Handbook ***E.R./L.E.1162***

THE EDISON SWAN ELECTRIC COMPANY LIMITED, 155 CHARING CROSS ROAD, LONDON, W.C.2

L.E.7

12

Masters of Craftsmanship

10

THOMAS TELFORD 1757-1834

The stone-mason who became the famous builder of roads, canals, bridges and harbours. His name is associated with Menai Suspension Bridge, the Ellesmere and Caledonian Canals, and with the rebuilding of many Scottish harbours. He was responsible for the construction of some 900 miles of roads and over 100 bridges in Scotland alone, apart from an immense amount of other public work.

Truly a master-craftsman who was, by his inspiring powers, a ***Master of Craftsmanship.***

9

In the electrical sphere Ferranti Ltd. justify the title—*Masters of Craftsmanship.* Throughout the world the name stands for acknowledged supremacy in performance.

Ferranti Clocks provide a typical example ; in thousands of homes, factories, offices and institutions, they are relied upon for split-second accuracy.

FERRANTI *Clocks*

FERRANTI LTD. HOLLINWOOD, LANCASHIRE

London: Bush House, Aldwych, W.C.2

PARKINSON

BUXTON CERTIFIED

FLAME-PROOF MOTOR

A special feature—the four—direction terminal box has a detachable sealing chamber for quick and safe connection and disconnection in explosive atmospheres.

CROMPTON PARKINSON

Limited

TANGENT

"Tangent" Products include

SOUND SIGNALS
LUMINOUS CALL SYSTEMS
STAFF LOCATORS
MINING SIGNALS
FIRE, BURGLAR AND
BANK RAID ALARMS
TELEPHONES
INTERPHONES
WATCHMAN'S CLOCKS
ELECTRIC
IMPULSE CLOCKS
SYNCHRONOUS CLOCKS
STRIKING, CHIMING AND
TOLLING MECHANISM
LIQUID-LEVEL
INDICATING
RECORDING AND
ALARM APPARATUS
IDLE-MACHINE AND
OUTPUT RECORDERS
SPECIAL APPARATUS

CONFIDENCE

is the keynote on which the reputation of "TANGENT" Apparatus has been built. Expertly designed and of sound construction, it commands confidence—for 70 years it has held a pre-eminent place in the Electrical industry and has gained confidence. "TANGENT" Apparatus is fulfilling many important duties and will continue to contribute to the progress of Industry.

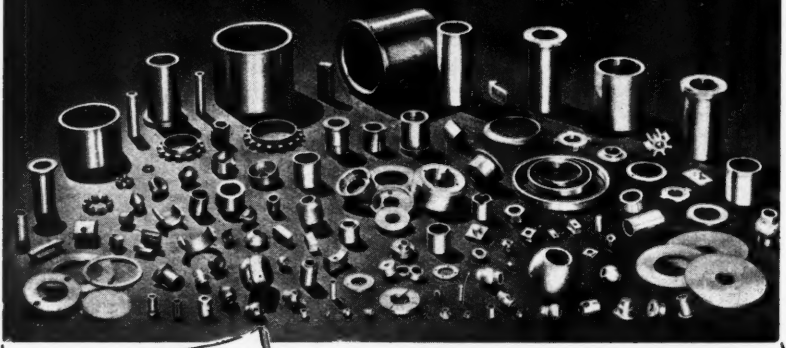
For priority work good deliveries can be given.

GENTS' OF LEICESTER ESTAB. 1872

GENT & CO. LTD., Faraday Works, LEICESTER

Also at LONDON • NEWCASTLE-ON-TYNE • GLASGOW • BELFAST • DUBLIN

'Compo' Diversification



We shall be pleased to send a copy of this new brochure to any interested person. Our Service Department and Testing Laboratories are ready to help designing and production engineers with problems of remote or inaccessible bearings.

THE OIL-RETAINING BEARINGS FOR BETTER MACHINES & APPLIANCES

Compo H Bearings are die-pressed from true alloy bronze powders and provide a perfect co-ordination of strength, structure and porosity. The oil is impregnated into the bearing and during operation is fed to the shaft by capillary attraction. These bearings are adaptable to load conditions, for when a varying amount of lubrication is required the temperature of the bearing controls the supply of oil. This means better and more economical lubrication with very low maintenance costs.

COMPO H
BRONZE BEARINGS

BRITISH BOUND BROOK BEARING CO. (PROPRIETORS: HARDY SPICER & CO. LIMITED),
Birch Road, Witton, Birmingham 6. *(A Birfield Company)*

TRADE
HIGGS MOTORS
GOVERNING DIRECTOR WALTER F. HIGGS, M.I.E.E. LTD.
MARK
BIRMINGHAM, 6 ENGLAND

AUSTERITY

If you cannot buy a Higgs Motor at least buy a "standard" motor no matter where you purchase.

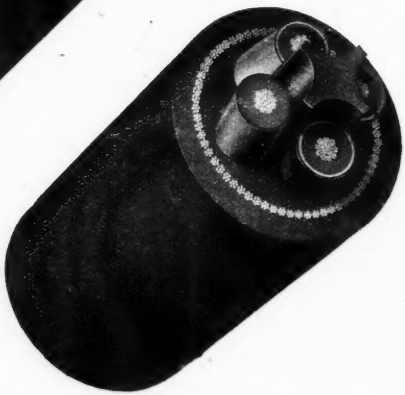
Special machines involve extra time and labour with consequent reduction in output. Modify your requirements to suit the motor—not the motor to your requirements.

Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Nottingham, Peterborough, Sheffield, Wolverhampton.

GLOVERS ***PLIABLE ARMOURED*** CABLES

Designed to reduce danger to workmen as recommended in circular No. 87 of H.M. Mines Dept.

Medium Pressure Trailers for use with "Temporarily Fixed" Apparatus such as Conveyors, Loaders and the like.



High Pressure Trailers for use in Quarries, Open-cast Workings, Gravel-pits, etc.

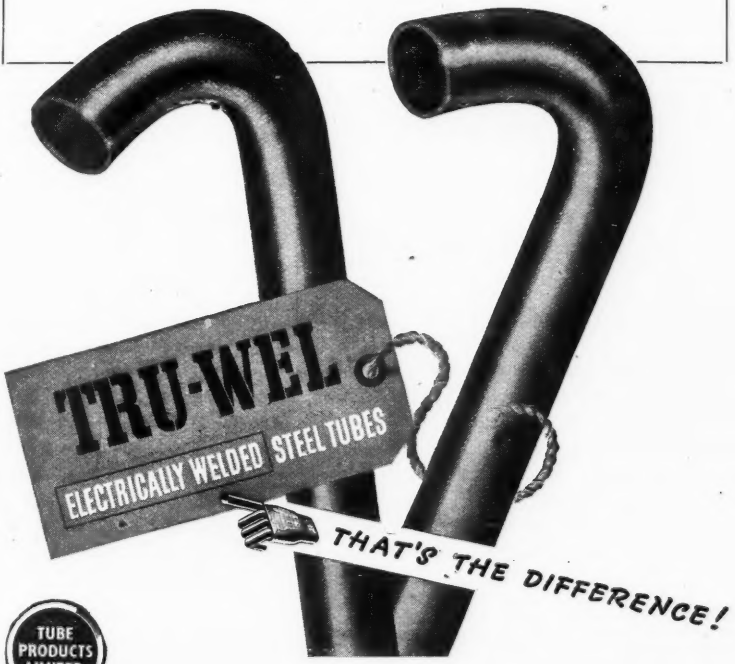
Head Office :

W. T. GLOVER & Co. Ltd.

TRAFFORD PARK **MANCHESTER 17**

HERE'S THE LOW-DOWN ON STEPPING UP

The decision to use electrically welded steel tubes is nearly always the start of a new speed-up in production. Naturally so, because a true tube (and Tru-Wel Tubes *are* true) can be manipulated so easily that processes are saved, labour is saved, time is saved, materials are saved and money is saved by using tubes for standard parts wherever possible. Tru-Wel, the electrically welded steel tubes made by Tube Products Ltd., are produced at speed and every length is tested for wall strength. They will undoubtedly play a leading part in post war stepping-up.

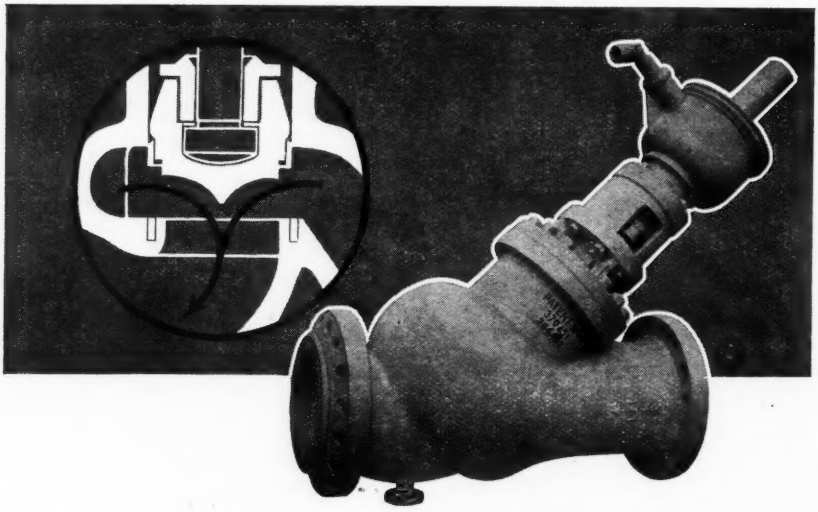


TUBE PRODUCTS LIMITED

TUBE INVESTMENTS LIMITED, STEEL TUBES ADVISORY CENTRE, ASTON, BIRMINGHAM. Manufacturers who need advice or information on any job where steel tubes might help, will find The Steel Tubes Advisory Centre ready to assist them in every possible way.

T.2.E

VALVE EFFICIENCY
IN THE MODERN PLANT



Operating conditions on modern high pressure high temperature services have emphasised the need for certain important readjustments in the trend of present day valve practice, if efficient performance is to be maintained. The problems concerned are well known to every engineer, and a complete answer is now made available in the Blakeborough High-Efficiency stop valve. Thoroughly proved on Loeffler boilers on the Continent, operating at pressures of 1900 lbs. per sq. in., 932° F., and on our own test plant at 2500 lbs. per sq. in., 1100° F., the valve is eminently suitable both for extreme and normal-condition services; a full range of patterns exist in forged and cast steel, bronze and cast iron for all regular requirements, details of which are given in publication No. 178. The illustration is of a 12 in. bore turbine stop valve for a working pressure of 650 lbs. per sq. in., 850° F. (with flanges for Aitons "Corwell" joints).

BLAKEBOROUGH

J. BLAKEBOROUGH & SONS, LTD., BRIGHOUSE, ENGLAND

NALDERS

FIRST GRADE HYPER-SCALE

100 200

N C S

INSTRUMENTS

NALDERS Hyper-Scale, Air-Damped, Soft Iron Instruments—Gravity Control—are available for alternating or continuous current. Readings are accurate and dead-beat, dials being 3", 4", 5", 6" or 8" diameter as required. Power consumption is low and working parts are completely insulated from casings.

N.C.S. PRODUCTS include all types of Electrical Measuring Instruments as well as Protective Relays, Synchronisers, Circuit Breakers, etc. In the complete range every need of accuracy, reliability, durability and convenience is fully met, prices being competitive without sacrifice of quality.

N.C.S. EXCELLENCE IS A RECOGNISED STANDARD

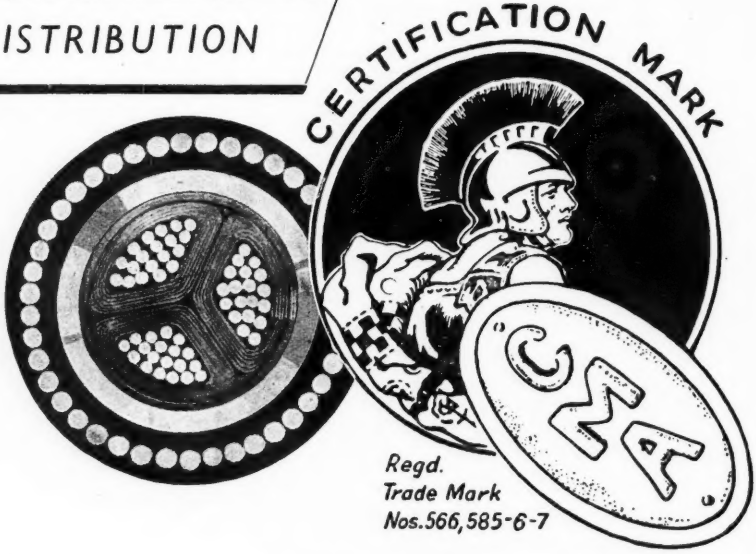
Quotations on request

NALDER BROS. & THOMPSON LTD.

DALSTON LANE WORKS, LONDON, E.8

Telephone : CLIssold 2365 (3 lines) Telegrams : OCCLUDE, HACK, LONDON

OUR MINISTRY OF DISTRIBUTION



Regd. Trade Mark Nos. 566, 585-6-7

THE uninterrupted production of the necessities of national existence depends on the continuous service of the country's electrical distribution systems. A small fault or breakdown may hold up the work of hundreds of machines and thousands of men.

Insist upon the use of

C.M.A. CABLES

The World's Standard of Quality

MEMBERS OF THE C.M.A.

The Anchor Cable Co. Ltd.	Crompton Parkinson Ltd. (Derby Cables Ltd).	W. T. Henley's Telegraph Works Co. Ltd.	The London Electric Wire Co. and Smiths Ltd.	St. Helens Cable & Rubber Co. Ltd.
British Insulated Cables Ltd.	The Enfield Cable Works Ltd.	The India Rubber, Gutta-Percha & Telegraph Works Co. Ltd. (The Silvertown Co.)	The Macintosh Cable Co. Ltd.	Siemens Brothers & Co. Ltd. (Siemens Electric Lamps and Supplies Ltd.)
Callender's Cable & Construction Co. Ltd.	Edison Swan Cables Ltd.	Johnson & Phillips Ltd.	The Metropolitan Electric Cable & Construction Co. Ltd.	Standard Telephones & Cables Ltd.
The Craigpark Electric Cable Co. Ltd.	W. T. Glover & Co. Ltd	Liverpool Electric Cable Co. Ltd.	Pirelli-General Cable Works Ltd. (General Electric Co. Ltd.)	Union Cable Co. Ltd.
	Greengate & Irwell Rubber Co. Ltd.			

Advt. of the Cable Makers' Association, High Holborn House, 52-54 High Holborn, London, W.C.1. *'Phone Holborn 7633*

REMOTE CONTROL OVER A.C. SUPPLY NETWORKS

D.C. BIAS

FOR

A.R.P. SERVICES

LAST MINUTE WARNINGS

STREET LIGHTING AND OFF PEAK LOAD CONTROL

OUR Engineers will be glad to place their experience at your disposal. Illustrated literature will be gladly sent to principals upon request.

Standard Telephones and Cables Limited

NEW SOUTHGATE, LONDON, N.11

Telephone : ENTerprise 1234

ANACOS REGD.

COPPER STRIP

The most up-to-date precision machinery and highest quality materials are employed in the manufacture of Anacos Copper Strip, with consequent accuracy and reliability.

Anacos Copper Strip being used in the manufacture of a circular Lifting Magnet.

TELEPHONE BLACKFRIARS 8701 (8 lines)

FREDERICK SMITH & COMPANY
(INCORPORATED IN THE LONDON ELECTRIC WIRE COMPANY AND SMITHS, LIMITED)
ANACONDA WORKS, SALFORD, 3, LANCS.

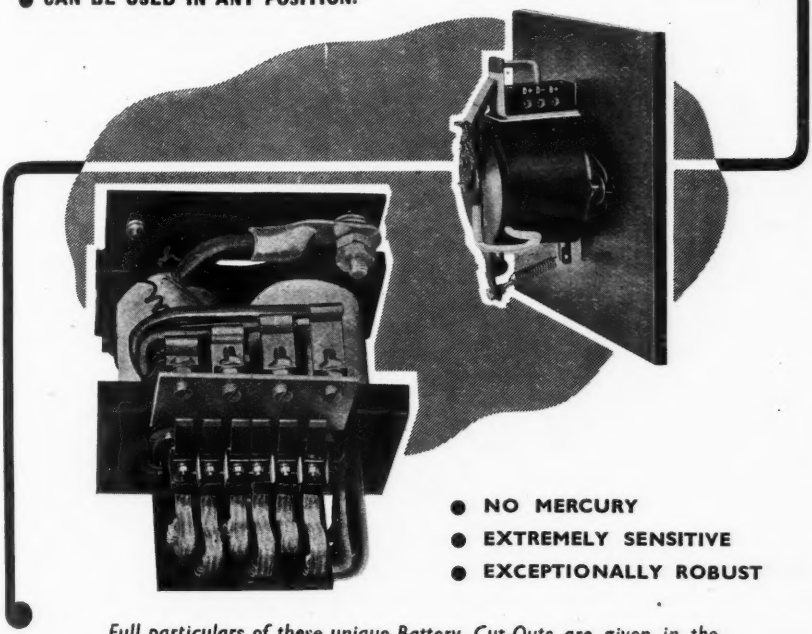
TELEGRAMS "ANACONDA" MANCHESTER

CRYPTON

NON-MERCURIAL *Automatic* BATTERY CUT-OUTS

This new exclusive development offers many outstanding features which include the following advantages :—

- **EXTREMELY SIMPLE—MOST RIGID DESIGN.**
- **EXCEPTIONALLY LOW REVERSE CURRENT—FROM 2%.**
- **WIDE OUTPUT RANGE FROM 10-400 AMPS. 1-110 CELLS.**
- **CAN BE USED IN ANY POSITION.**



- **NO MERCURY**
- **EXTREMELY SENSITIVE**
- **EXCEPTIONALLY ROBUST**

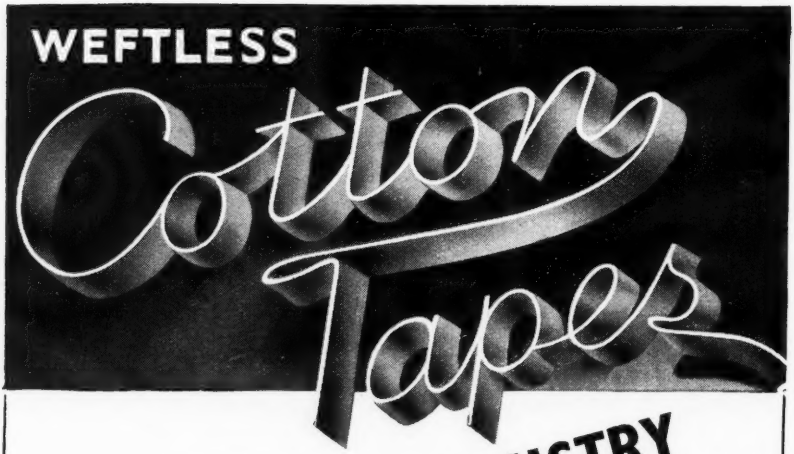
Full particulars of these unique Battery Cut-Outs are given in the "Crypton" Leaflet GL.10, a copy of which will be promptly posted you upon request to :—

CRYPTON EQUIPMENT LTD.

REGD OFFICE: **GEORGE STREET, BRIDGWATER, SOMERSET.**

TELEPHONE: BRIDGWATER 2614-5 • TELEGRAMS: 'CRYPTOQUIP, BRIDGWATER'.

Associated Companies: LANCASHIRE DYNAMO & CRYPTO LTD., MANCHESTER · FOSTER TRANSFORMERS & SWITCHGEAR LTD., WIMBLEDON, S.W.19.



FOR THE **ELECTRICAL INDUSTRY**

A.I.D. APPROVAL No. 2583/42

AVAILABLE IN THICKNESSES .003", .0035", .005"
IN WIDTHS FROM ⅛" TO 1" IN WHITE & COLOURS

USE IT FOR

Cable Identification, Cable Jointing, Winding Coils in Electric Motors, Interleaving Wires in Transformers, Cable Harness for Aircraft, Tanks, etc. General Factory Maintenance

.003" and .0035" TAPES AS A SUBSTITUTE .. FOR SILK TAPE FOR INSULATION ..

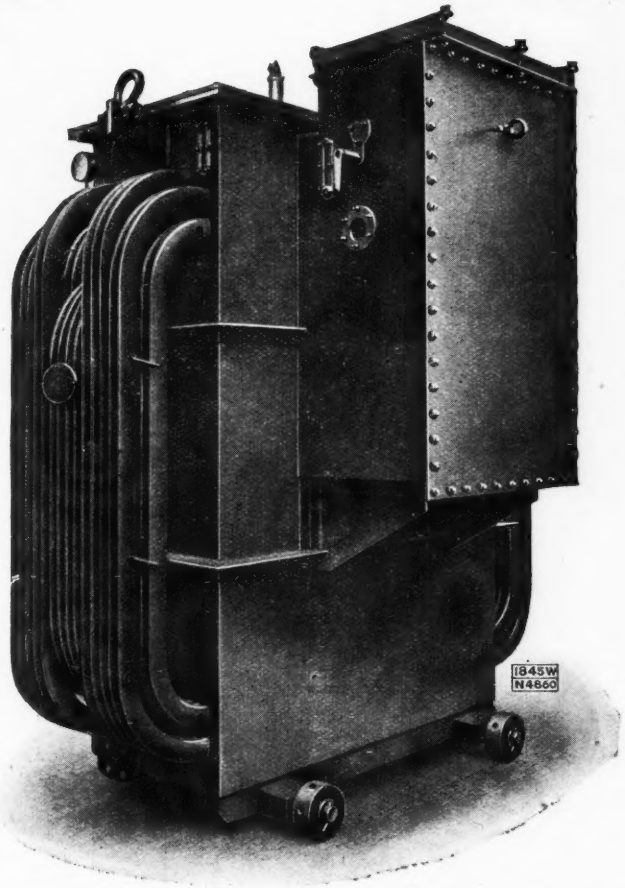
Numbered Tapes for identifying cores in multiple cables

P.P. PAYNE & SONS LTD

HAYDN ROAD NOTTINGHAM *Phone*: 64335
BUSH HOUSE LONDON *Phone*: TEMple Bar 6356

E.C.C.

E.C.C. transformers excel in design and construction, therefore in performance.



1,250 kVA TRANSFORMER WITH ON-LOAD TAP-CHANGING GEAR

THE ELECTRIC CONSTRUCTION COMPANY, LIMITED

NORTHAMPTON Maidwell 241

LONDON Cecil Chambers, Strand W.C.2 Temple Bar 8306

WOLVERHAMPTON 21455

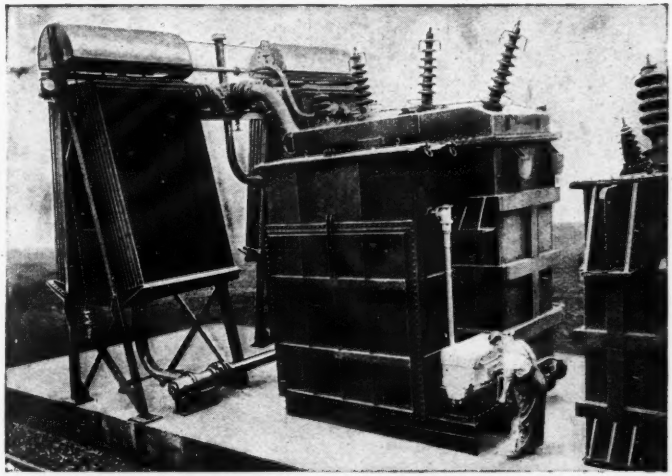
266

CRYSELCO

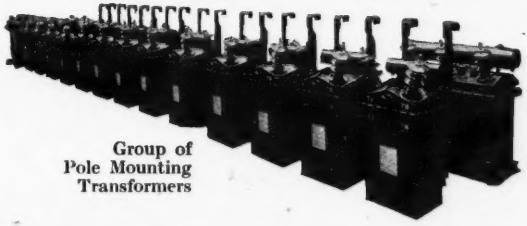
"Current" "Saving Bonds." Buy them!

CRYSELCO LIMITED BEDFORD

PARSONS TRANSFORMERS



20,000-kVA Parsons three-phase Transformer, fitted with on-load voltage regulating equipment.

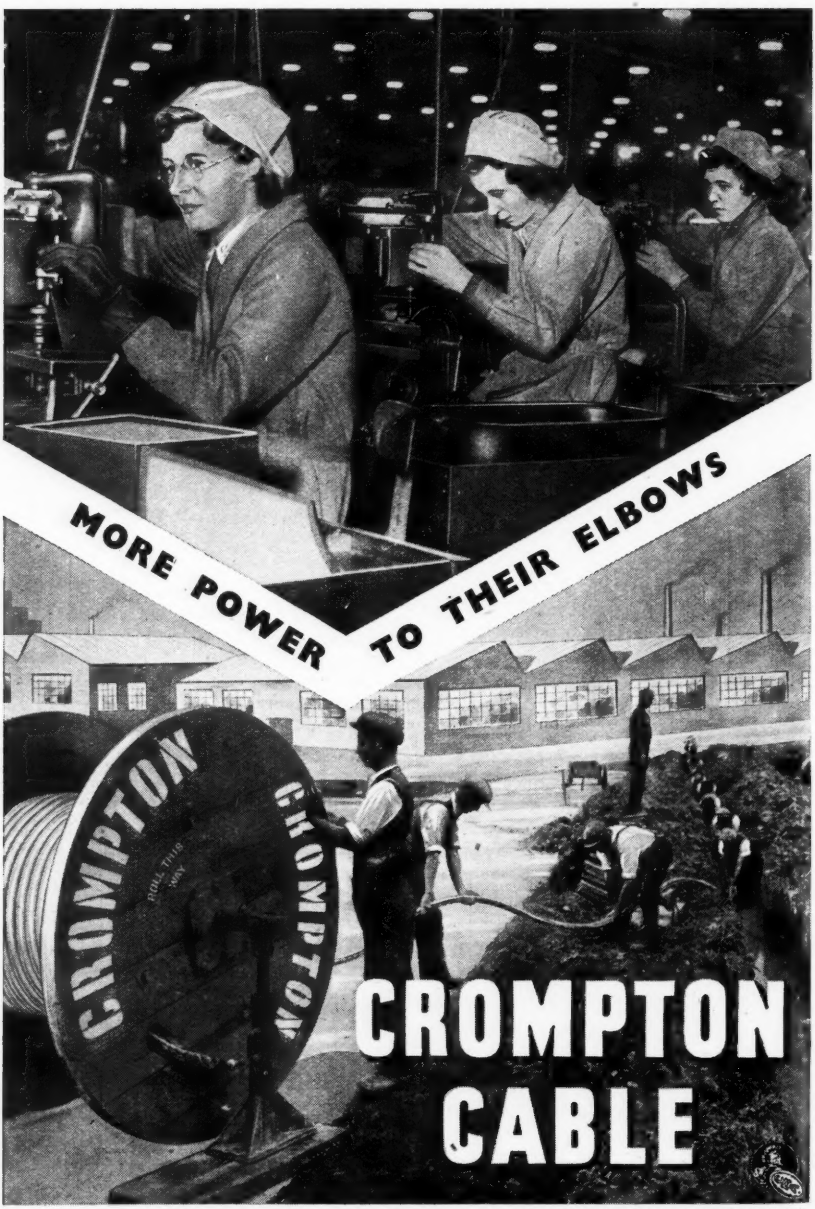


Group of Pole Mounting Transformers

C.A. PARSONS & COMPANY LTD

HEATON WORKS, NEWCASTLE-ON-TYNE. LONDON: 56 VICTORIA ST., S.W.1

I.P.S.—P 15318, 9739



CROMPTON PARKINSON LTD., ELECTRA HOUSE, VICTORIA EMBANKMENT, LONDON, W.C.2.

ÆSOP in 1942

This is the story of the proud frog who, trying to equal the size of an ox, so puffed himself up that he burst.

Moral: ***Foolish pretence may lead to disaster.***

There is no pretence about the Metrovick Organisation—it is world-wide and includes engineering staffs and agents thoroughly well acquainted with the country in which they operate.

EQUIPMENT COVERING EVERY SIDE OF THE ELECTRICAL INDUSTRY FROM LARGE TURBO-ALTERNATORS TO LAMPS AND FRACTIONAL H.P. MOTORS.

METROPOLITAN Vickers

ELECTRICAL CO., LTD.

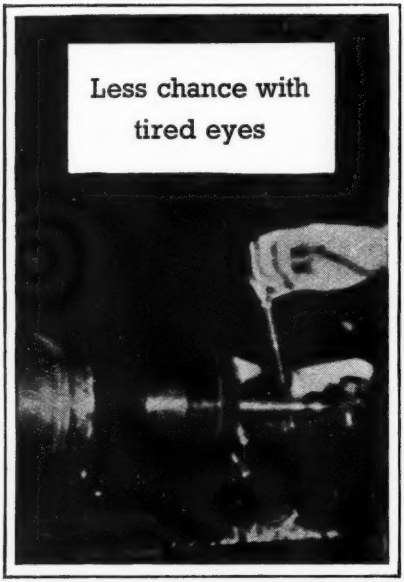
TRAFFORD PARK ··· MANCHESTER 17.

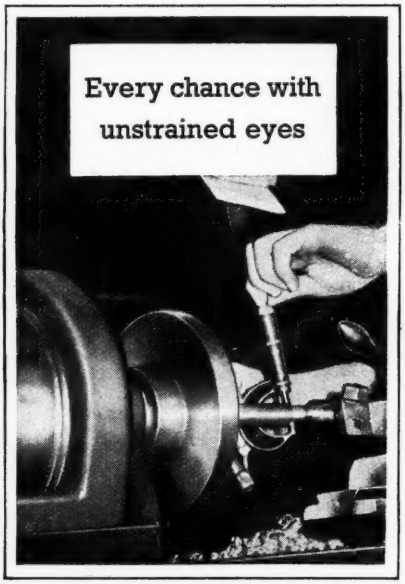
COSMOS LAMPS *Metrovick's 'light' product*

B AX/A 201

WHAT CHANCE ACCURACY

towards the end of the shift?





Operatives can only work as well as they can see. Poor lighting produces rapid fatigue of the eyes with consequent reduction in accuracy and output. But, with the abundant daylight of the Crompton Fluorescent Tube, you can have peak output day and *night*. The Crompton Fluorescent Tube allows excellent colour discrimination and abolishes glare, hard shadows and reflected dazzle. It also reduces current costs, for an 80w. tube produces almost as much light as a 200w. filament lamp, whilst its life is twice as long. It saves the nation's fuel and increases the quality and quantity of output.

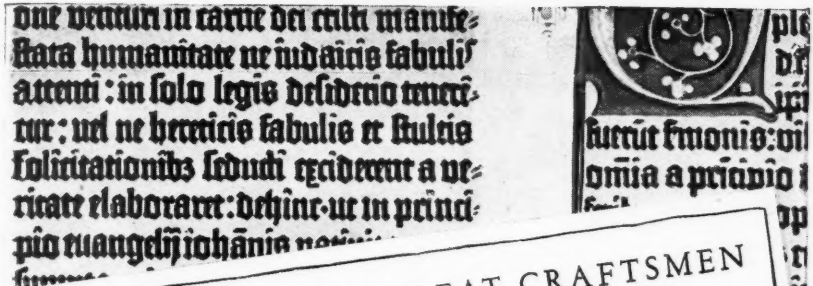
LET THE CROMPTON LIGHTING SERVICE *PLAN* YOUR LIGHTING

CROMPTON *fluorescent* **TUBE**

80 WATTS. LENGTH 5 FT.

CROMPTON PARKINSON LTD., ELECTRA HOUSE, LONDON, W.C.2

Telephone: Temple Bar 5911 *Telegrams: Crompark, Estrand, London*



MEMORIES OF THE GREAT CRAFTSMEN

Johann Gutenberg

[CIRCA 1440]

Almost exactly five hundred years ago a Rhenish bookseller in Mainz began to print by means of movable type. In this way he was able to produce hundreds of copies of a book in less time than it formerly took to transcribe one in manuscript. But the craft of book production did not die in consequence of this invention. It was replaced by a new and wider craftsmanship. The skill of the typographer replaced that of the scribe.

What the casting of movable type accomplished for printing, the development of mechanisation is doing for modern industrial production. For example, in the M.E.M. factory there is a mechanised foundry where light castings for electrical switch and fuse gear are made in the great quantities required to-day. The skill of the M.E.M. engineers and foundrymen is thus reinforced and multiplied. High standards of quality and reliability are maintained whilst output is expanded to meet the larger demand of modern conditions. That is what we mean by the New Craftsmanship.

MIDLAND ELECTRIC MANUFACTURING CO., LTD., TYSELEY, BIRMINGHAM, 11

London Showrooms and Stores:
21-22, Rathbone Place, London, W.1.

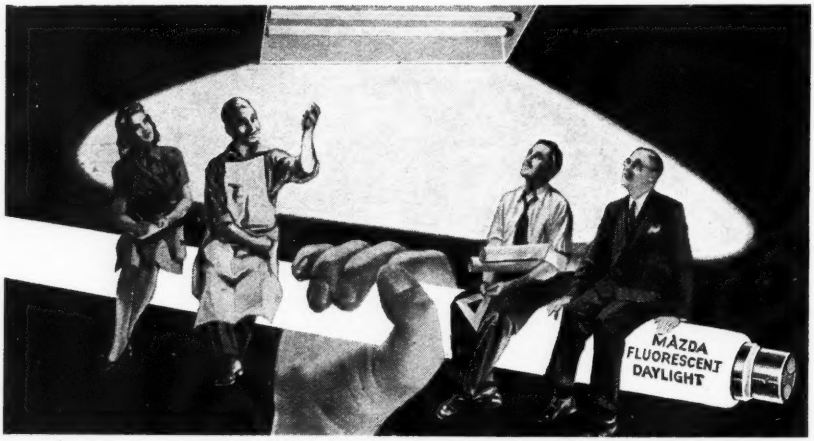
Specialists in Switch, Fuse and Motor Control Gear.

M·E·M

Manchester Showrooms and Stores:
48-50, Chapel Street, Salford, 3.

Manufacturers of High Efficiency Electric Fires.

Reproduced from a page of the famous Gutenberg 42 line Bible



SUPPORT YOUR WORKERS WITH GOOD LIGHTING

Of the many different items of factory equipment, none has a greater effect than lighting on the productiveness and welfare of the workers. Therefore you can best support their efforts by giving them the kind of lighting they need for maximum output with minimum fatigue.

To-day, many important factories employed on essential work are getting things done faster, better and in greater safety and comfort by the aid of B T H Light-Conditioning — which prescribes the kind and degree of lighting required for maximum results in any given circumstances.

Let B T H Lighting Engineers help you to plan efficient lighting for production and welfare.

MAZDA Lamps
with MAZDALUX Equipment

M 3943 *B T H for all Electrical Plant and Equipment*

THE BRITISH THOMSON-HOUSTON CO., LTD., CROWN HOUSE, ALDWYCH, LONDON, W.C.2.

ELECTRICAL REVIEW

Volume CXXXI — No. 3376

Friday, August 7, 1942

Contents

	Page		Page
Editorial—Fuel Saving in Industry	163	Correspondence	179
Rural Industry	165	The I.E.E. Council. By J. W. Thomas, LL.B., B.Sc.	181
World Mineral Resources	169	Liability for Repaired Goods	182
The Giorgi M.K.S. System. By Eng. H. A. Ferreira	171	Commerce and Industry	183
Wartime Wiring	174	Electricity Supply	186
Difficulties in Eire	175	Financial Section	187
Fuel Economy	176	New Patents	192
Personal and Social	177	Contract Information	193
Classified Advertisements	61	Index to Advertisers	72

EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1.

Telegraphic Address: "Ageekay, Sedist, London." Code: ABC. Telephone No.: Waterloo 3333 (35 lines).
Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.
Subscription Rates, Postage free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £1 14s. 8d. per annum.
Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW LTD., and crossed "Lloyds Bank."

3 STAPLE INN

BEADS
INSULATORS
RESISTANCE
WIRES

All Ex-Stock

Lionel Robinson
& Co. Ltd.
3 Staple Inn
London, W.C.1
Telephone - - HOLborn 6322

Berry's

THE HALL MARK OF QUALITY

FIRES · FITTINGS · SWITCHGEAR · WATER HEATERS · ETC.

Weston
Aircraft INSTRUMENTS
POSITIVE KNOWLEDGE - FROM TAKE OFF TO TOUCH DOWN
Product of SANGAMO WESTON LTD. Enfield. Middx.

ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXI. No. 3376. AUGUST 7, 1942 6d. WEEKLY

Fuel Saving in Industry

A Necessity that is a Virtue

WHILE the threat of fuel rationing is still suspended over the public head it is gratifying to see that the Ministry of Fuel and Power is taking active, practical measures, some of which are mentioned in this issue, to secure a more reasonable use of coal, gas, electricity and oil in industrial and commercial establishments.

It is in this direction that immense savings can be made, with far less trouble than is involved in attempts to squeeze a problematical six (or ten) million tons of coal from the housewife, who, as a rule, cannot afford to be wasteful. This is not to imply that there is no scope for domestic fuel saving. It is still necessary to give useful hints to those whose ignorance or carelessness result in the use of more fuel than is required for a particular purpose.

Effective Advertisements Required

So far the most striking advertisement of the new series has been one showing the waste caused by allowing gas flames to lap the sides of a saucepan. We are still awaiting some good announcements covering such electrical points as were mentioned in the *Electrical Review* of July 24th.

It is felt that this can only be done effectively by full co-operation with representatives of the electricity supply industry. Mere exhortation to " switch off " this or that lamp or appliance is not enough. The public needs the sort of guidance which the Electrical Development Association is competent to give and, indeed, was largely formed to give—advice on the intelligent and efficient use of electricity.

This applies equally to the industrial and commercial uses of electricity where, as we have said, the greatest opportunities for economy arise. The aim of all production is to secure results with the least expenditure of time, labour and materials, but in concentrating on these fundamentals manufacturing concerns sometimes give insufficient attention to other factors which enter into production.

Fuel Ministry's Assistance

Although in wartime inefficiency and waste are criminal they are evils at any time and, in their own interests, industrialists should eradicate them. Economy in this respect is a necessity now, but it is always a virtue. Manufacturers, then, should be grateful for the assistance which the Minister of Fuel and Power is affording them in its endeavour to procure a saving in fuel consumption. They may feel that they are already subject to too much " bureaucratic interference," but such interference can be constructive in the hands of competent men with a knowledge of industrial needs and difficulties.

Full advantage should be taken of the advice and training which the Ministry is affording and this should be backed up by continued effort on the part of manufacturers themselves. There is only one way of ensuring this—by the appointment

in each works of any size of one or more individuals whose sole function should be the elimination of waste. These men must possess sufficient experience and authority to make themselves felt. Although fuel economy will be their first consideration it may be possible for them also to supervise the salvage arrangements which are of equal importance. They will incidentally save their employers a good deal of money and thus " earn their keep."

Reorganisation of Supply

LORD PORTAL, the Minister of Works and Planning, stated in the House of Lords recently that the Paymaster-General was dealing " in the first instance " with questions relating to the reorganisation of electricity supply until the new Ministry of Fuel and Power got into its stride. This statement is commented upon in the *I.M.E.A. Journal* which says that the gas industry has been invited to consider its own reconstruction problems. If it is to be inferred from this that the electricity supply industry has not been consulted, the fact remains that it will have to be. The matter is being taken up by the Joint Committee of Electricity Supply Associations with a view to action.

Skilled Men for Services

CERTAIN classes of skilled men, although not reserved, have hitherto been called up for the Forces only in their trade capacity. Now the Ministry of Labour and National Service has decided that some of these classes shall be available for the Services whether or not they are required in their trade capacities. On the face of it this decision does not square with the Government's avowed intention of doing its best to see that skill is not wasted in the Services, as it will be if this matter is not properly handled. The list includes two or three electrical classes, including magneto makers who, it would have been thought, were likely to be at a premium in a mechanised army.

The I.E.E. Council

AT the last annual general meeting of the Institution of Electrical Engineers questions were raised regarding the constitution of the Council and the topic has been discussed at meetings of the North-Western Centre, one of the members of which, Mr. J. W. Thomas, contributes an article to this issue. Mr. Thomas criticises the method of selecting and electing Council members, and says that representation of full members (he is one himself) is greatly out of proportion to that of the much larger associate member class, mainly by reason of the presence of centre chairmen and past-presidents. But many associate members could, if they wished, be full members. Another contention is that the non-university technical colleges have practically no representation on the Council, but on this point it is only fair to recall that Professor Parker Smith, although he is at a university, has been elected vice-president for the express purpose of giving adequate representation to these colleges.

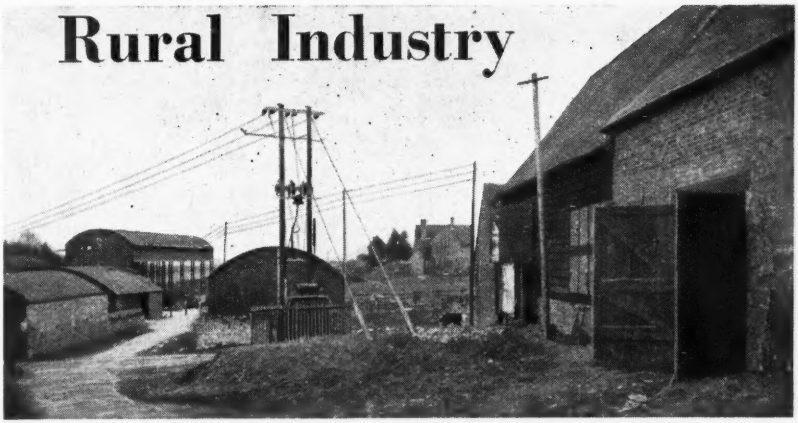
Wartime Installations

ELECTRIC wiring practice in this country is generally of a high standard when carried out, even approximately, to the requirements laid down by the Institution of Electrical Engineers. Consequently there is scope for relaxation when circumstances demand a saving of material and labour. This reserve is taken advantage of in the five new War Emergency Specifications just issued by the British Standards Institution which are reviewed in this issue. The principal features are the specifying of cleat wiring in lieu of conduit and the relaxation of I.E.E. Regulation 116 relating to the fusing of sub-circuits. Installations designed in accordance with the specifications should have a life of not less than three years, by which time, we hope, the causes of the relaxation will be removed.

Salaries and Taxation

WHEN the Electrical Power Engineers' Association agreed to the exclusion of war taxation in calculating salary increases for its members it was thought that this good example would be widely emulated. In point of fact no other organised body of workers has followed suit, and naturally the Association's members have become more than a little restive at the continuation of the system. This has caused the National Executive Committee of the E.P.E.A. to ask the employers to revert to the strict enforcement of the cost-of-living scale. It is recognised that this will not make a great difference to members' salaries but, it is pointed out, this argument cuts both ways—it is also a little matter to the supply undertakings.

Rural Industry



Based on a recent tour of the Shropshire distribution area of the West Midlands Joint Electricity Authority, this article demonstrates the beneficial results of the J.E.A.'s rural electrification enterprise

THE importance of having electrical facilities available in rural areas has been brought home forcibly by the war. Not only has the need for increased cultivation of the land—and fewer farm hands to do it with—called for the greater use of labour-saving electrical appliances, but the dispersal of industry throughout the countryside which has been undertaken as a counter to the bombing of the towns, has rendered the availability of electrical services indispensable. Factories already established, too, are almost certainly having to increase their output (though probably not of their normal products) and consequently require further help from electricity.

Both in the national and local interests it is fortunate, therefore, that in recent years so many enterprising electricity undertakings have embarked on schemes of rural electrification which have held out little prospect of immediate financial return but have formed part of a long-term policy of development aiming at giving supplies eventually to all and sundry throughout the area. Such an undertaking is the West Midlands Joint Electricity Authority (clerk and manager, Mr. H. F. Carpenter; engineer, Mr. J. Morton), which in 1930 commenced a distribution scheme for a 500-sq. mile area covering practically the whole of the county of Shropshire.

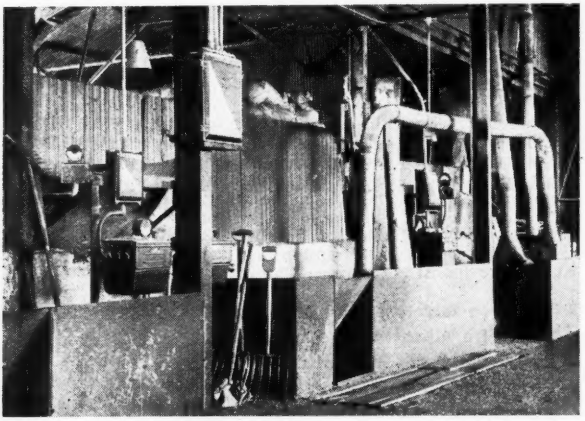
Till then this district was one of those about which it might be said that nobody thought it worth developing electrically, and except in Shrewsbury public supplies of electricity were non-existent. As there are in the whole area only four towns, Shrewsbury (which was not as a matter of fact included in the original scheme but was taken over in 1938), Wellington, Oakengates and Newport, and few villages of any size, it will be appreciated that the area is " truly rural " and has little in the way of compact centres of population to encourage the attentions of a supply authority. Indeed, in the greater part of the area it appears to be the exception rather than the rule for farmhouses, cottages, etc., to be clustered together.

A recent tour of the area in the company of Mr. J. R. Gay, development officer, Mr. G. W. Lewis, consumers' engineer and Mr. E. Morgan, power engineer, surprised us, however, not so much on account of the scattered nature of the premises as by the large proportion of them that had been given supplies. Even before the war a total of 18,500 consumers representing a maximum demand of about 11,800 kW had been connected. The number of consumers and maximum demand have increased considerably since that date.

Apparently no premises offering prospects of a reasonably good load, as for example, a farm, are, or perhaps we should say in view of the present restrictions on extension work, have been, considered too far from the supply network, and it is no unusual thing to find a half-mile stretch of overhead line erected to serve a single consumer. There have, indeed, been some cases where spur lines of even a mile in length have been erected for the benefit of one consumer. Because of voltage drop it is, of course, impracticable to employ a low-voltage line in such circumstances as these, and it is necessary therefore to extend the

11-kV system and provide a transformer close to the premises to be supplied.

This practice has resulted in the Authority having to maintain a large number of substations in relation to the number of consumers supplied, there now being about 300 11-kV/l.v. pole-mounted units in addition to the nine primary 33/11-kV, 45 secondary 11-kV/l.v. and seventy h.v. consumers' substations. Further evidence of the extent of the policy of covering the widest possible area is provided by comparing the lengths of the different types of mains at present in service. Omitting the Shrewsbury area, which in view of its urban characteristics presents a somewhat different picture, we find that while 11-kV lines extend for a distance of approximately 300 miles (260 miles overhead), l.v. mains total approximately 320 miles (190 miles overhead) and services only 250 miles.



Last year no less than 1,500 tons of grass meal was produced by Col. Pollitt's grass drying plant, the grinding and bagging equipment of which is seen above

About 50 miles of 33-kV lines are used to cover the area.

In furnishing these exceptional facilities the Authority has, of course, had to consider the financial aspect of the matter. By careful grading and spreading over of the installation charges there have, however, been few complaints that they have been too high. This is particularly true in wartime since in those cases in which extension of supply has been justified the consumer has been able to show a saving in labour costs at least equal to the charges for electricity supply.

Development has been further materially assisted by a well-thought-out scale of tariffs for energy supply (as given below) of which many consumers in urban areas might be glad to avail themselves. Unlike so many present-day tariffs these charges, which, incidentally, have not been increased since the war, are straightforward and readily understandable—a feature appealing particularly strongly to the farmer who likes to know "how he stands" without elaborate calculations.

The flat rate for lighting is 6d. per kWh and for heating and cooking 1½d. per kWh. Power is 2d. per kWh for the first 200 kWh per quarter, 1½d. for the next 9,800 and 1d. for the remainder, while an alternative business two-part rate for lighting, heating, etc., has a fixed charge based on the lighting installation plus a "unit" charge of ¾d. A two-part rate is also available for residential premises, with a fixed charge based on floor area plus a "unit" charge of ¾d. All the foregoing charges are subject to a reduction of 10 per cent. for payment within a month of the date of the invoice.

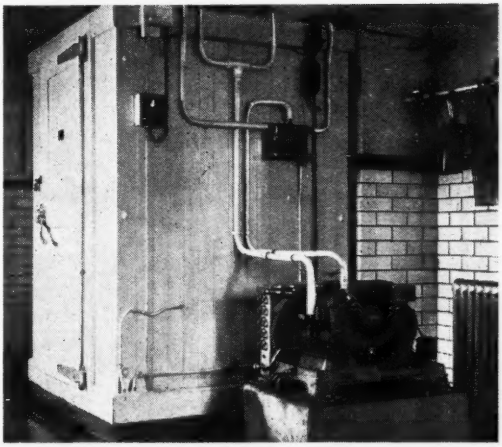
For large low-voltage supplies (minimum 10 kVA) a new tariff has recently been introduced with a kVA charge of £8 per annum, plus a "unit" charge of ¾d., while high-voltage supplies are charged for at £4 per kVA per annum plus 0·4d. per kWh for the first 500,000 kWh a year and 0·3d. above that figure (plus coal adjustment). In the Shrewsbury borough the flat rates for lighting, heating and power are somewhat lower.

Since the war began certain facilities have inevitably had to be withdrawn. Off-peak charges, for instance, have had to be discontinued except in the case of grass-drying plants, while on the domestic side assisted wiring has been stopped and there are no longer facilities for new users to hire cookers, water heaters, wash boilers, fires and other appliances.

Although the Authority does not operate a wiring section, leaving installation work to contractors, its specialist engineers are always prepared to give advice on any particular problems that may crop up. To facilitate this service showrooms and offices have been opened at Shrewsbury, Wellington, Newport, Ironbridge, and Shifnal, and a site for new and enlarged showrooms has been acquired in Shrewsbury. In common with other showrooms throughout the country these are also actively assisting in the national food and fuel economy campaigns.

Special pride is also taken in the undertaking's record for maintaining and, when

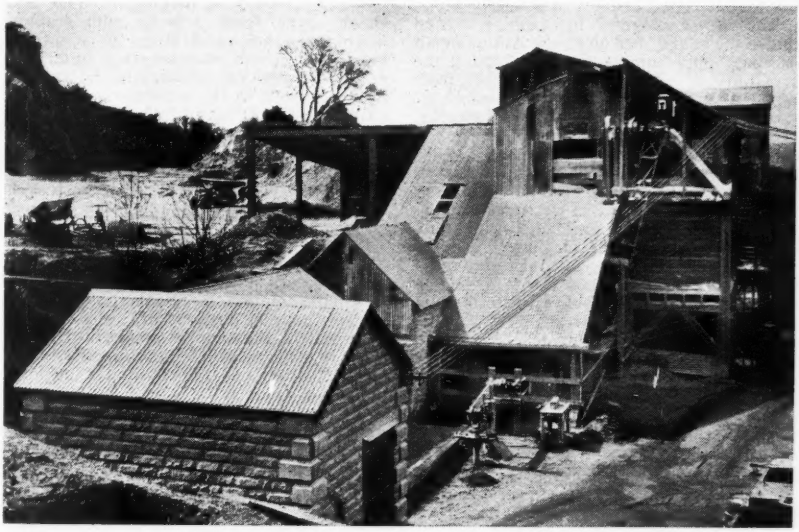
necessary, rapidly restoring supplies. To ensure that men shall be on the scene of any trouble at the earliest possible moment, and also to assist work generally, the mains and construction department operates from two centres, Wellington and Shrewsbury, covering respectively the eastern and western areas. In charge of this branch of the Authority's activities is Mr. R. A. Woods, distribution engineer.



Several agricultural applications of electricity are to be seen at the Harper Adams Agricultural College. Here is a cold room in the dairy

As might be expected, owing to the rural nature of the district the farming community and its associated industries have provided, at any rate numerically, the greatest scope for industrial development. Since the distribution scheme was started no fewer than 530 farms, etc., have been connected representing probably about 4,000 kW of connected load.

When electricity was first made available there were inevitably the farmers' usual conservatism and mistrust of new developments to contend with. Various ways were adopted to overcome this attitude. Personal contacts, practical demonstrations and above all recommendations by satisfied users have proved most satisfactory. Sometimes it has only been through the foresight and persuasiveness of the rising generation of farmers, who realise that in the future it is only by "mechanising" and commercialising their methods that their farms can be made to pay,



In two years the savings effected in the cost of operation brought about by changing over to electricity have paid for the new plant at the Salop County Council's quarry

that electricity has been adopted. Since the war this attitude has inevitably undergone a radical change, the farmers being only too glad to take advantage of any help available to compensate for their labour shortage. In every case it has not been considered justifiable, in present circumstances, to give supplies, but every effort is made to comply with the demands of the farmers if they can put forward good cases.

Manual labour is minimised by using electrical plant in the quarrying of coal outcrops

The varied nature of the farming carried out in the county has given the Authority an excellent opportunity of demonstrating the versatility of electricity. As distinct from many other parts of the country, most of the farms specialise in one branch or another, say, dairy farming or root crops, and rarely combine two or more. Mr. S. Mayall's farm at Preston Gubbals, one of those we visited, is for example engaged purely in dairy work. Its comprehensive electrical installation comprises motors for chaff cutting, mill, pumps, etc.; a milking machine; a bottle washer; two sterilisers; a cold room and a 60-gal. water heater.

Similarly Col. Pollitt's 1,000 acre farm at Cressage concentrates—or at any rate it did until present requirements made it necessary to change over a large part of the land to arable cultivation—on grass drying, and last year in fact produced no less than 1,500 tons of grass meal. The new T.C.I. Mark III drying plant recently installed there handles an average of 12 tons a day and can deal with as much as 22 tons in dry weather. Each half of the machine has a 15-HP Mather & Platt motor operating a Matthews & Yates "Cyclone" fan which draws hot air from coke furnaces through the grass. This practice of grass drying is spreading rapidly and there are already, or soon will be, four others in the J.E.A.'s area. Another interesting innovation, for which the war is responsible, is the installation by Major Foster of an electrically-driven corn mill intended, we were told, to ensure that flour is available in the event of an invasion.

Sugar beet cultivation is of interest inasmuch as the processing factories take supplies for pumping and maintenance from the Authority during the nine months of the year when they are not working, the large amount of steam required in the refining work making it more economical for the factories to generate their own electricity for driving the machinery used. Several creameries in the district have been extensively electrified, as has also the C.W.S. glasshouse at Roden, while many farmers who have adopted electric threshing express satisfaction.

Several agricultural applications of electricity are to be witnessed together at the Harper Adams Agricultural College at Edgmond, where farmers of the future learn to take advantage of modern methods. A milking machine, cold room, cattle food pulping and grinding machines, a hoist and mixer for pig food, incubators, hovers, pluckers, silage cutters and pumps are some of the more usual apparatus installed, while in the laboratories there are centrifuges for testing the fat content of butter, shaking machines for mixing up samples of soil, etc. A laundry provided is equipped with an electrically driven washing machine, calender and irons.

Industrial Undertakings

Although, numerically, farming and associated concerns represent such a large proportion of industrial users of electricity, their consumption represents only a small part of the total disposed of. In fact, more than half of the supplies to the distribution area are made up of h.v. bulk supplies, which go to a variety of large consumers including numerous engineering works of all types, collieries, iron and steel works, barytes mines, wire rope and chain factories, quarries, gravel and asphalt works, brickworks, saw mills, etc.

It may not be generally known that Shropshire was one of the earliest parts of the country to establish iron and steel works on a large scale: the Coalbrookdale Iron Co., for instance, has been in existence since the

year 1709. In recent years, until the war, competition from elsewhere resulted in their operations being somewhat restricted or even stopped. Now, however, when every production facility is required they have come into their own again and, whereas before the J.E.A. started operations these factories (except those in Shrewsbury) generated their own electricity, they are now rapidly changing over to the Authority's supply, to their advantage, both financial and otherwise. This process of changing over is, of course, much in evidence in other industrial concerns established before the public supply of electricity was available, and in almost every case expansion of work beyond the capacity of the generating plant installed means another consumer for the J.E.A. The mining and crushing of barytes (barium sulphate), which is much in demand for making paint, face powder, etc., is another old-established industry peculiar to the district that has benefited by the coming of electricity.

An excellent example of the way in which the taking of a supply of electricity from the Authority has not only saved labour, but has also been a most profitable transaction is provided at the Salop County Council's Niils Hill Quarry. In two years the savings effected in the cost of operation brought about by the use of electricity actually paid for the new plant, which includes motors for the main crushing plant (85-HP synchronous induction unit), compressor for quarrying (17-HP), tarring plant (25-HP) and concrete mixers. As the electrical equipment needs scarcely any attention and no skilled operator, there is no longer any need for the services of the maintenance engineer previously required for the steam plant. The conversion to electricity has also been responsible for the works being the cleanest of its type we have ever seen.

Though requiring only a comparatively small amount of electricity, a new development brought about by present conditions is the quarrying of coal outcrops. By installing, say, a 5-HP motor for winding gear and a 2-HP unit for a pump manual labour required is reduced to a minimum and output speeded up considerably. The J.E.A. has gone to much trouble to give these facilities and in some instances has made quite long extensions of lines for the purpose.

Lack of space prevents further enlargement on the Authority's activities, but we hope that we have said enough to indicate the spirit of enterprise and initiative that pervades its work.

World Mineral Resources

Russia's Favourable Position

THE clause of the Atlantic Charter which promises access on equal terms for all to the raw materials of the world has been the subject of further public utterances, both official and unofficial, on both sides of the Atlantic. The attention thus called to this important matter prompts some detailed consideration of the facts and views submitted to the recent meeting convened by the British Association. Editorial reference was made in last week's *Electrical Review* to the resolution which was passed at the close of that conference, asking the Council of the Association to consider means by which it could assist in carrying out the provisions of the clause.

The official figures of imports and exports, including countries of origin and destination, which were quoted, showed that before the interruption of trade and transport brought about by the war, the countries producing the key minerals were sending them regularly to those which needed them. There seems to be no evidence that any nation financially capable of effecting a purchase was prevented from doing so.

Electrical Uses

In the course of a detailed survey of new metals and new methods, reference was made to the infinitude of the possible combinations of metals with one another. The first recognition, partly accidental, that steel could be made to resist corrosion by incorporating 14 per cent. or so of chromium led to the development of the important class of stainless steels, while the new magnet steels, containing aluminium and nickel, and in their later forms also cobalt and copper, brought about a revolution in the construction of electrical instruments and loud-speakers. For other purposes such as the clutches used for holding work in milling and grinding machines, they replaced electro-magnets. Tungsten, thanks to its high melting point, had superseded all other materials for the filaments of electric lamps. The non-metal selenium was used in photo-electric cells.

Germany, which lacked copper, had greatly increased its production of aluminium and adopted it for overhead power lines. This was described as natural, but it was pointed out that a similar replacement in the windings of motors and dynamos was attributable to the blockade and could not be defended on other grounds. Such substitutions had been very numerous during the period of armament and hostilities.

Of instances given of the substitution of an entirely new material for one of which the supplies had been found to be inadequate or too costly, an outstanding one was plastics, of which the growing utilisation in the electrical industries is well known. But a warning was added that such substitutions do not necessarily lessen Great Britain's dependence on mineral resources, although the relative importance of different deposits might be altered.

A number of speakers emphasised the fact

that the relatively new alloys used in steel manufacture were with few exceptions unevenly distributed in districts remote from steelworks; that no nation was self-contained in its resources of such minerals; and that only to a small extent could substitutes be provided.

To take a leading example: the successful manufacture of steel by any country, particularly steel demanding the special qualities required by the armament maker (and, be it noted, the electrical engineer) calls for manganese. It is indispensable. Yet the United States has had to import all but about 5 per cent. of its requirements. The United Kingdom has been the fourth largest importer in the world, Belgium coming next and Japan not far after. Germany and France are importers, and, incidentally, accumulated large quantities from abroad before the war. Now comes the question: To what sources have these manganese-importing countries had access? The answer is that Russia, which has produced on an average not far short of one-half the world's output, has been the largest exporter, with India very close behind, the Gold Coast and South Africa coming next. The three parts of the Empire named have together produced 1,500,000 tons in a year (compared with Russia's 2,500,000 tons) out of a total of 4,850,000 tons.

Distribution of Steel Alloys

The geographical distribution of some other of the leading elements used in the alloy steel industry is also significant. Nickel ore production is focused essentially on localised deposits in Canada. Chrome ore, whilst very widely distributed, is produced in Rhodesia and South Africa, Turkey and Russia, and in lesser degree in Cuba, the Philippines, India, Yugoslavia and Greece; tungsten ore in China, Burma and, to a smaller extent, in the U.S.A. and South America. Molybdenum production is largely obtained from deposits in the U.S.A., and vanadium ore comes mainly from Rhodesia and South West Africa, the U.S.A. and Peru. Cobalt ore is derived principally from the Belgian Congo, Rhodesia and Canada. In short, the principal steel-producing countries, the U.S.A., Russia, Germany, Great Britain, France, Japan, Belgium, Luxembourg and Scandinavia are dependent upon the normal functioning of international trade and transport, particularly in the form of shipping.

Russia Nearly Self-sufficient

Attention was drawn to the rapid strides made by Russia towards self-sufficiency in mineral supplies and, incidentally, towards complete investigation of its mineral resources. It had built up a geological survey with a staff of 10,000 (compared with hundreds or less in other countries). As a result, although much remained to be done, knowledge of such resources had increased enormously and revealed that Russia might prove to be the most nearly self-supporting political unit in the world in respect of essential minerals.

Another paper contributed brought the conference from the general to the particular regarding Russia's mineral wealth. She produces not only nearly half the world's manganese but also a quarter of its chromite, of which the principal consuming countries are the United States, Germany and France.

For tungsten and molybdenum the Union relies very largely upon imports. Among the world's platinum producers Russia has long held either first or second place and will continue to be a leading exporter of the metal. With the opening up of deposits in the Kirghiz, the U.S.S.R.'s mercury supply and demand are roughly balanced. Of nickel, Russian supplies have so far proved to be inadequate, but by exploiting several extensive low-grade nickel silicate deposits in the Kola Peninsula and in northern Siberia, she may well become independent of imports in times of peace.

Nickel Production

A detailed account of the sources and uses of nickel was given. Most of it was used in steel, either alone or in company with chromium, molybdenum, manganese, copper, or vanadium; and a guess was hazarded that 80 per cent. of it would come from Canada during our lifetime, and a forecast was made of the possibility that nickel would be required in India and China to a greater extent than in the Western countries as soon as a higher standard of living was developed there and aeroplane, automobile and rail transport was used to a greater extent.

The conference accepted the view, already put forward authoritatively in more than one quarter, that any handicap that Germany might have felt before the war in securing mineral supplies had been due to the boomerang effect of her currency manipulation. Similarly Japan suffered no handicap from pre-war international arrangements, at least in British territory, as witness her freedom to prospect in Malaya. As a result her mining enterprises secured leases over the deposits and she had been able to export iron ore, manganese and bauxite in her own ships for use in the manufacture of armaments. Japan in past years had drawn at least two-thirds of her tin from the Straits Settlements.

At the same time more than one of the experts who had prepared papers for the meeting were evidently of opinion that certain of the methods of regulating mineral production had not in the past been on a sufficiently international basis. That there were two sides to the question of free access was fully recognised. Those enjoying the privilege must not abuse it. If they did, effective sanctions should be enforced against them. As things are at present inability to obtain certain metals, such as tungsten, nickel and chromium, would make a nation almost defenceless against others which could obtain them. By accumulating stocks of all three before the war Germany had shown her recognition of this fact.

Peat Research

MOVING a vote of £12,000 to bring the total in connection with the Research Department of Eire up to £19,000, Mr. Eamon de Valera, in the Dail, said that most of the experiments of the past year dealt with fuel problems, including the manufacture of peat charcoal for mobile producers and peat for town gas manufacture. Full-scale experimental plant had been installed at the Turraun Bog Development station. Attempts had been made to develop an electro-static filter, but difficulties had been experienced in adapting the laboratory instrument to use on a lorry. An experimental wet filter washing of gas with soda solution had given promising results in used lubricating oil, but the consumption of oil proved rather high. The vote was agreed to.

The Giorgi M.K.S. System

Derivation and Comparison of Units

By Eng. H. Amorim Ferreira (Lisbon)

Translated from the Portuguese by the I.E.C. and edited by E. W. Marchant, D.Sc., M.I.E.E., Emeritus Professor of Electrical Engineering, University of Liverpool

QUANTITIES employed in calculations must all be expressed in units of the same system. Thus in the relation $F\Delta t = m\Delta v$, between the increase Δv in the velocity of a body of mass m and the constant force F applied to that body during the period of time Δt, the values of F, m, Δt, Δv must signify units of the same system.

If the expression contains the quotient of two magnitudes of the same kind their values may be indicated by any unit, provided it is the same for both. To calculate, for instance, the elongation Δl of a prismatic bar of length l and of sectional area s, produced by application of tensile force F when E denotes Young's modulus of the substance of the bar, then $Fl = Es\Delta l$ so that the value of Δl is denoted by the same unit that represents l, whatever system may be chosen to express F, E, s.

In the absence of a single coherent system of units for all physical magnitudes the CGS system (centimetre-gramme-second) has been preferred to the metric for fundamental definition; nevertheless CGS units of mechanical magnitudes are invariably awkwardly smaller than most values that have to be measured in practice. That system is the only one which has hitherto extended into electricity, being divided into electrostatic and electromagnetic systems of units, which in general tend to be either too large or too small; yet to have to employ two systems of units for the same group of magnitudes is undoubtedly inconvenient.

Although the primary definitions of the International Electricity Congress of 1881 in Paris were intended to become the absolute electric units, there were only nine of them and they were numerically inapplicable to such important laws as those of Biot and Savart (electromagnetism), Coulomb (electrostatic and magnetostatic) and Laplace (electro-magnetic) and Hopkinson's (magnetic) formula without introducing further constants.

The situation continues to be aggravated by the use and abuse of " ready-made " formulæ with numerical coefficients requiring determined arbitrary combinations of units. For instance, the expression $prd = 2{,}870 \times 10^{3}Tm$ relates the mass m and volume v of a perfect gas of relative density d at pressure p and temperature T (expressed in CGS units), whereas $p = 0.0056\ v^2$ relates velocity v of wind (expressed in kilometres per hour) to the pressure p (expressed in kilogrammes per square metre) it exerts on square or circular surfaces of up to 10^{3}m area, normal to the direction of the wind. In addition there are isolated units, consecrated by tradition, which do not belong to any system, such as the calorie (quantity of heat), atmosphere (pressure), degree (of angle), etc.

Consequential trouble, recognised by all who have to calculate with figures, can be eliminated by adherence to the MKS system that was first submitted in 1901 by the Italian engineer G. Giorgi and independently three years later by the English engineer D. Robertson; it was adopted in 1933 by the American section of the International Union of Pure and Applied Physics, in 1935 by the International Electrotechnical Commission (confirmed at a subsequent meeting in 1938) and in 1939 by the Consultative Committee on Electricity of the International Committee on Weights and Measures.

This coherent and complete system of units for all the physical magnitudes, the use of which it is desired to generalise in technical and scientific applications, is capable in all practical cases of advantageously replacing all others at present in use, not because these are faulty or contradictory, but because they are complicated and difficult to apply. The object is rather like that of substituting for a perfect, but clumsy, tool another one more simple to handle.

Mechanical Definitions

The fundamental units of the MKS system* are the metre (length), the kilogramme (mass), the second (of mean solar time), degree centigrade (temperature), and ampere† (electric current). From the metre (symbol m) are derived units for other geometrical magnitudes, that of surface being the square metre (m^2) and that of volume the cubic

* See absolute definitions, *Electrical Review*, September 20th, 1940, p. 240.

† The fourth unit has caused much discussion, without I.E.C. decision, the most generally approved being μ_0= permeability of free space $= \frac{1}{10^{7}}$, see also *Electrical Review*, April 26th, 1940, p. 475.

metre (m^3); their multiples and sub-multiples are known. The unit of angle is the radian (abbreviation: rad) and that of solid angle is the steradian (sterad) both of which are independent of the system of units chosen; the degree (0.01745 rad) and grade (seldom used = 0.01571 rad) are isolated units of angle.

From the metre and second (s) are derived units of kinetic magnitudes; that of velocity is the metre per second (m/s), that of acceleration is the metre per second per second (m/s^2), that of angular velocity is the radian per second (s^{-1}), that of angular acceleration is the radian per second per second (s^{-2}), that of frequency is the cycle per second (c/s) or hertz.

From the kilogramme (kg) and those units already defined, others are derived for mechanical magnitudes; that of force, and therefore of gravity, is the newton (N) defined by the equation $F = ma$, where F is the force which, when applied to a mass m gives it the acceleration a. Since the CGS unit of force is the dyne and the metric unit is the kilogramme then 1 dyne = 10^{-5} N and 1 kg (force) = 9.8 N, since the acceleration due to gravity is 9.8 metres per second per second, which means that the weight (expressed in MKS units) of a body with a mass of 5 kg is 59 N.

The unit of work, and of energy, is defined by the equation $W = Fl \cos \alpha$, where W is the work done by the constant force F in the displacement l of its point of application and α is the constant angle between the direction of the force and the direction of displacement. This unit is evidently 10^7 times greater than its CGS alternative, which means that the MKS unit of energy is the joule (J). Since the CGS unit of energy is the erg and the metric unit is the kilogramme-metre, then 1 erg = 10^{-7}J. While the practical unit of power is the watt (W), in the CGS notation it is the erg per second (erg/s); another common unit is the metric horse-power (cheval vapeur Cv) and 1 erg/s = 10^{-7}W while 1 Cv = 735 W.

The unit of pressure is the newton per square metre (N/m^2) defined as $F = ps$, where p is a uniform pressure which, exerted over a surface of area s, produces on it a normal force F. But in CGS units it is the bar = $10^{-1}N/m^2$ and also in use are the millibar (mb) = $10^2N/m^2$, or kg/m^2 = 9.8 N/m^2, or kg/cm^2 = 98 × $10^3N/m^2$, or lb/in^2 = 6,890 N/m^2, or mmHg = 133.3 N/m^2, or an atmosphere (atm) = 101,325 N/m^2.

That the unit of density is the kilogramme per cubic metre (kg/m^3) follows from the equation $m = \rho v$, where m is the mass of a body of volume v and ρ is the density of the substance of the body; in CGS units it is the gramme per cubic centimetre (g/cm^3) so that 1 g/cm^3 = 10^3 kg/m^3. It must be remembered that the mass m and volume v of a body are related by the expression $m = \rho v = \rho_a v d$, where ρ and ρ_a are the densities of the body and of the substance of comparison respectively, $d = \rho/\rho_a$ being the relative density of the body. For solids and liquids the substance of comparison is water at 40°C with a density of ρ_a = 1,000 kg/m^3, while gases are compared with dry air at atmospheric pressure and temperature 0°C for which ρ_a = 1,293 kg/m^3.

From the degree centigrade and those units already defined may be derived such thermodynamic magnitudes as specific and latent heats, calorific value, entropy, etc. The favoured unit of heat quantity is equivalent to the joule though the calorie (one cal = 4.17 joules) is also in use. Thus the specific heat of liquid water at 15°C is 1 cal/g/degree, or 4,170 J/kg/degree in MKS units.

Electrical Magnitudes

In 1939 the Consultative Committee on Electricity of the International Committee on Weights and Measures proposed to define the fundamental electric unit (ampere A) as "the current which, flowing through two parallel rectilinear circuits of infinite length and negligible circular section, one metre apart in vacuo, produces between those conductors a force of 2 × 10^{-7} newton per metre length." This is equivalent to saying that μ_0 (the permeability of free space) is $\frac{1}{10^7}$. The ampere thus defined coincides with practice, as do the second and joule; it follows that all the practical electric units conveniently conform to the MKS system, including the coulomb (quantity of electricity C), volt (potential V), ohm (resistance Ω), farad (capacitance F), henry (inductance L) and weber (magnetic flux Wb). The relationships between them and electrostatic (U_{es}) and electromagnetic (U_{em}) units of the same magnitudes are known, thus:—

Current 1 $U_{es} = \frac{1A}{3 \times 10^9}$ and 1 U_{em} = 10A

Quantity 1 $U_{es} = \frac{1C}{3 \times 10^9}$ and 1 U_{em} = 10C

Potential 1 U_{es} = 3 × 10^2V and 1 U_{em} = 10^{-8}V

Resistance 1 U_{es} = 9 × 10^{11} Ω and 1 U_{em} = 10^{-9} Ω

Capacitance 1 $U_{es} = \frac{1F}{9 \times 10^{11}}$ and 1 U_{em} = 10^9F

Inductance 1 U_{em} = 10^{-9}L

Magnetic flux 1 U_{em} = 10^{-8}Wb

The figures 3 and 9 appearing in the above relations stand respectively for the numbers 2.9978 and 8.987, the latter being the square of the former.

Electrical formulæ make it possible to define MKS units for all the other electric and magnetic magnitudes and to relate them to the electrostatic and electromagnetic units. Compound terms are easily formed for any

of the MKS units, such as volt per metre for the unit of electric field, or weber per square metre for the unit of magnetic induction, etc. Such traditional names as ampere, coulomb, volt, etc., will be unnecessary when a single system is generalised, thus :—

Electric field 1 $U_{es} = 3 \times 10^4$ MKS

Dielectric constant 1 $U_{es} = \frac{1}{9 \times 10^9}$ MKS

Electrostatic flux 1 $U_{es} = \frac{1}{3 \times 10^9}$ MKS

Magnetic field 1 $U_{em} = 10^3$ MKS

Magnetic flux 1 $U_{em} = 10^{-8}$ MKS

Magnetic space permeability 1 $U_{em} = 10^{-7}$ MKS

Magnetic moment 1 $U_{em} = 10^{-10}$ MKS

Magnetisation (force) 1 $U_{em} = 10^{-4}$ MKS

Magnetic susceptibility 1 $U_{em} = 10^{-7}$ MKS

Magnetic induction 1 $U_{em} = 10^{-4}$ MKS

Magnetomotive force 1 $U_{em} = 10$ MKS

Reluctance 1 $U_{em} = 10^9$ MKS

The unit of dielectric constant is fundamental to the electrostatic system and, by definition, the free space value is $E_0 = 1\ U_{es} = \frac{1}{9 \times 10^9}$ MKS. Similar division is necessary for conversion in the electromagnetic case of space permeability (μ_0) = 1 $U_{em} = \frac{1}{10^7}$ MKS. In other words some values which appear in certain books and tables as abstract numbers, as if they were the ratios E/E_0 and μ/μ_0, need appropriate division in order to be expressed in the preferred MKS units.

For example, the capacitance of a condenser consisting of two metal plates of 1 m² surface area separated by a sheet of mica 1 mm. thick is calculated from the expression $4\pi Cx = E s$. Working with electrostatic units x = 0.1 cm and s = 1×10^4cm² while E = 5.8 U_{es} ; therefore C = 4.61×10^4 U_{es}. Working with MKS units x = 1×10^{-3}m and s = 1 m² while E = $\frac{5.8}{9 \times 10^9}$ MKS; therefore C = 0.0512×10^{-6} F = 0.0512 F. The two values are equal.

It is not necessary to introduce a new fundamental unit for defining optical magnitudes. The initial quantity of light, which is energy, is expressed in joules in the MKS system. Such compound names as luminous flux, radiation density, luminous intensity, illumination brightness, emissive power, etc., are not needed. Photometric units include the candle, lumen, lux, phot and others with compound names, but they are applicable optically only to corresponding visible radiations. The mechanical equivalent of white light is 0.01 W/lm.

A particularity of the CGS system is the simplification resulting from the density of water at 4 deg. C, being 1 g/cm³, to which the relative densities of solids and liquids are related. Whereas absolute and relative values are numerically equal in technical applications, the latter must be multiplied by 1,000 kg/m³ to obtain the former in MKS units. This simplification does not apply to gases, in which cases relative values have to be multiplied by the absolute density of air at the pressure and temperature of the particular gas concerned, which will not be unity. Even so, the MKS system is advantageous because it should avoid the different procedure that is so frequently troublesome in calculations involving gaseous masses. When applying the formula $m = \rho_a vd$ it is necessary in all cases to consider the density ρ_a of the substance of comparison, which is 1,000 kg/m³ for solids and liquids and 1.293 kg/m³ for gases at 0°C and 1 atm as explained above.

Since the dielectric constant of air is 1.00059 U_{es} and its magnetic permeability is 1.0000004 U_{em}, calculation of electrostatic actions in air is simplified by the use of electrostatic units. But as each of the two different CGS systems of electric units serves only a limited purpose, the inconvenience of perpetuating both for the same group of magnitudes is incontestable.

Students will not have to remember, or work out, relationships between different units; teachers' tasks will be eased and technicians in general will not need to choose the units in which they may elect to express the magnitudes which figure in the relationships they employ to solve concrete problems. But the transition period will certainly be long. Some schools are beginning to employ MKS units, but few authors have attempted their systematic use.

Mica and Rubber Supplies

THE discovery of extensive mica deposits in South Westland has been confirmed by the Minister of Mines, states the *New Zealand Electrical Journal*. A preliminary examination by geologists has indicated that the deposits are of sufficient importance to warrant a detailed survey. Pegmatites, in which mica occurs, are known to exist over an area of 89 square miles on the crest of the Mataketake Range at elevations ranging from 4,000 to 5,000 feet. The area is rugged, with precipitous slopes to the westward, and in parts heavily bush-clad. Samples of mica received from the area are stated to be good.

It is reported in the *Daily Telegraph* that all Tanganyika's rubber output, both plantation and wild, is now controlled by regulations issued last week in the drive to produce the utmost in accordance with the British ruling giving rubber priority over all other products of the Territory. The Far East firm of Jardine, Matheson & Co., which was recently appointed as managing agents of all plantations taken over by the Government, has now appointed purchasing agents for the wild rubber throughout the Territory for the Ministry of Supply. Most of the plantation rubber is situated in the northern coastal areas. It totals 10,000 acres in one province alone, but has been largely derelict for the last 30 years.

Wartime Wiring

New Standard Code of Practice

IN order to reduce installation material and labour costs to the minimum five new War Emergency British Standards have been issued by the British Standards Institution. They have been prepared in conjunction with the Codes of Practice Standardisation Committee (of which the I.E.E. is convenor) and are issued under the authority of the Ministry of Works and Planning. Government Departments and electrical associations were consulted in the preparation of the standards.

The principal one is B.S. 1602/1942 "The Planning of Electric Wiring Installations : Low and Medium Voltage." It is noted that the adoption of some of the recommendations entails a certain degree of risk and a reduction in the life of the installations ; a "target" life of three years is aimed at. Substitute materials may have to be used for some of those which are specified.

An installation should comply with (i) the Eleventh Edition of the I.E.E. Regulations (as modified in June last) except as further modified by the code, but work in accordance with the code is not to be regarded as a "temporary installation" under Section 5 of the Regulations; (ii) British Standard Specifications already issued ; (iii) the Electricity Commissioners' Regulations ; (iv) Home Office Factory Regulations ; (v) Statutory Rules and Orders ; and (vi) the requirements of licensing authorities in respect of installations in certain classes of buildings.

The supply authority concerned should be notified when the installation is projected and a suitable tariff arranged. Separate circuits for different classes of load should be avoided with a view to the adoption of a two-part tariff. Previous standards should be followed where there are special conditions or where risks must not be taken.

Basis of Design

Cleat wiring should generally be specified, cables being run in conduit only in special cases. The cables should be v.i.r. taped, and may be braided for conduit systems. Tough-rubber-protected cables should be used only in special cases. Cables in open roof spaces may be strung from truss to truss if desired ; intermediate supports, if they are considered necessary, should be indicated on drawings or schedules.

Unprotected cleat wiring should preferably be on the surface but may be run in concealed spaces if necessary. Cables passing through walls or floors or within 5 ft. 6 in. of the floor should be mechanically protected. Cleat wiring running across floor joists should preferably be threaded through holes in each joist on the neutral axis. Fuses should comply with B.S. 88, having regard to the anticipated maximum current.

A final sub-circuit may supply any number of points, including motors, provided that under the planned conditions of use the actual load does not exceed the capacity of the wiring. Where an appreciable amount of wiring can be saved teeing off should be used in place of looping-in and, where further economy can be made and the maximum load on the final sub-circuit does not exceed 15 A, a reduction may be made in the size of the branch conductors of the sub-circuit without the provision of the additional fusing required by No. 116 of the I.E.E. Regulations. In such cases the smallest conductor must not be less than one-third of the size of the largest. Regulation 116 may be relaxed to allow the installation of fuses at any convenient point in a reduced-section branch of a conductor rated for more than 15 A in both lighting and power circuits. Capacity of wiring should be determined by reference to the I.E.E. Regulations (as modified).

Lighting Installations

Switches controlling individual lights should be dispensed with and sub-circuits controlled by switches of sufficient capacity. The use of flexible cords should be restricted.

General lighting, although less economical in current than individual lighting, will often be found more satisfactory as regards capital cost and flexibility and should be designed to give 6 ft.-candles at the working plane. Switches should be cord operated or placed 5 ft. 6 in. from the floor. In offices requiring more than one switch, one should be placed near the door and the others, of the ceiling type, placed in the cable run.

Shades should be of plastic material and used only where they are necessary. Essential individual lights should not exceed 60 W and pendants should be used in preference to table standards.

Similar general considerations apply to factory and workshop lighting. For large spaces and in gangways and loading bays of stores and warehouses one 15-A switch is preferable to a number of 5-A switches in order to save wiring.

For external services armoured cables should be used only in cases of absolute necessity. Unarmoured p.i.l.c. and served cables should be buried at a safe depth and carefully covered in. Bare wiring on insulators should be carried overhead on poles, buildings, or, in suitable circumstances, trees. Conductors on the face of buildings may have to be insulated.

Bells and signalling systems should preferably be mains operated. All cables connected to the neutral should be black ; no other conductors should be black except bare earth wires and cables.

I.E.E. Regulations Relaxed

Relaxation of the following I.E.E. Regulations is permitted :—No. 304 should in general be complied with for circuits other than motor circuits, but where the voltage of the consumer's installation is regulated (preferably automatically) the voltage drop may be such that the voltage at the terminals of any lamp or appliance is not less than 95 per cent of the declared voltage. In motor circuits the voltage at motor terminals, under normal load conditions, should not be less than 92.5 per cent. of the

declared voltage. No. 306 (A).—The use of stranded conductors shall not necessarily apply to branch cables. No. 402 (A) and (G).—Unprotected wiring may be run and concealed as already specified.

The other Specifications deal in detail with the systems mentioned in No. 1062 ; they are as follows :—No. 1063.—Wiring on Cleats ; No. 1064.—Wiring in Conduit ; No. 1065.—Outdoor Distribution Systems ; and No. 1,066.—Bell and Alarm Systems. All the new standards can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, or the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, at 1s. each (1s. 3d. including postage).

Difficulties in Eire

Shannon Scheme's Reduced Output in 1941-42

ALTHOUGH the Electricity Supply Board of Eire was able to avoid imposing restrictions on electricity consumption until the beginning of this summer, it is clear from the facts given in the Board's report for 1941–42 that the task of maintaining the supply without curtailment during that period was exceedingly difficult. It was thought likely that general rationing would become necessary during last summer, and preliminary arrangements were made accordingly.

Added to the problem of obtaining adequate supplies of imported coal, the season was exceptionally dry and the output from the Shannon hydro-electric plant at Ardnacrusha was reduced to 240.3 million kWh compared with 257.8 million kWh in the previous year. To make up for this decrease as well as to cope with the growth in demand the output of the Pigeon House steam station had to be raised from 174.8 million kWh to 209.4 million kWh.

Hydrometric data given in the report show that the average inflow to the catchment at Killaloe during the 1941 calendar year was 70 per cent. of the mean, and during the period from the beginning of May until the middle of October it was less than for the very dry year of 1933.

Increased Domestic Consumption

In May last year the Board took the precaution of discontinuing the sale of cooking and heating appliances at its showrooms, but in spite of this domestic consumption represented the principal factor in the increase in kWh sold from 345.2 million to 357.3 million. Domestic sales amounted to 143.5 million kWh, which exceeded the previous year's figure by 27.5 per cent., and general heating, cooking and water-heating sales expanded by 11.1 per cent. to 27 million kWh. In all other categories decreases are recorded, as follows (million kWh):—Motive power, 128.1 (against 138.9); public lighting, 8.4 (15.0); traction, 6.3 (7.1); and miscellaneous, 5.5 (6.9). Additional consumers connected numbered 16,672, making 200,419 altogether.

Towards the end of 1941 tariffs were raised by 10 per cent., which is reflected in the advance in the average price paid per kWh sold from 1.44d. to 1.47d., the same as for 1939–40. It was estimated that in a full year the additional revenue would be enough to meet the extra expenditure for which the higher price of coal was largely responsible, but as far as last year was concerned liabilities exceeded revenue by £121,554; this had to be met by a transfer from the contingencies reserve. Total revenue was £2,191,596 (against £2,082,522) and working expenditure £1,500,419 (£1,276,540). Under the heading of "generation," fuel, operating expenses, maintenance and repair exceeded the total for the previous year by £200,000. It is noted that no provision has been made in the accounts for the Board's contributions under the superannuation measure introduced in the Dail last February.

Dealing with development works, the report states that a substantial portion of the electrical and mechanical equipment for the Poulaphouca and Golden Falls power stations of the Liffey Scheme had been delivered at March 31st last and was in course of erection. Owing to the war delivery of the remainder had not been obtained, and it was not possible to state when the plant would be in commission.

Survey work on the lower Liffey at Leixlip has been carried out, and detailed investigation of the possible hydro-electric development of the River Erne has been continued. Except for the construction of a railway embankment which will be utilised temporarily by the Turf Development Board, Ltd., it has not been possible to undertake any work on the construction of the proposed peat-fired generating station.

During the past year a special study of the further extension of electricity supply to the farming community has been begun at the request of the Government, and plans and estimates have been prepared covering typical farming areas.

Transmission works completed during the year have included the erection of 113 miles of overhead lines at 10 and 38 kV and the laying of small lengths of 5- and 10-kV cables. The previously constructed 110-kV Inchicore-Dundalk line was changed from 38-kV to 110-kV operation. Distribution extensions aggregated 100 miles, mostly overhead.

Incidentally, it is of interest to record that the Shannon Fisheries administered by the Board brought in a much larger revenue from the sale of fish and the letting of fishing rights—£20,234 compared with only £5,176 in 1940–41.

The Wimbledon Pension

FURTHER particulars respecting the writ issued by Mrs. Greta Linden, of Wimbledon, in respect of the payment of a pension of £2,426 to Mr. Mackenzie by the Wimbledon Corporation, show that the plaintiff asks for a High Court declaration that inasmuch as £3,000 of Mr. Mackenzie's salary was paid by the London and Home Counties Joint Electricity Authority during the past eight years or thereabouts, such sum is not liable to be taken into account in any pension or superannuation paid by the Corporation pursuant to the Local Government Superannuation Act, 1937.

Fuel Economy

Statements by Major Lloyd George

REPLYING to questions in the House of Commons on July 28th, Major Lloyd George said that he launched the fuel economy campaign which he was conducting in co-operation with the Minister of Information in a broadcast on June 28th. Whilst it was too early to gauge its effect, there was ample evidence that the public generally was already alive to the urgent need for economy. The B.B.C. was co-operating on a generous scale. The importance of fuel economy had been constantly stressed by announcers and other speakers, and hints on fuel economy were included almost daily in the Kitchen Front talks. Advertising had been started in the Press, both national and provincial, and in general there had been strong editorial support all over the country.

The possibilities of films as a vehicle for propaganda were being taken into account; as a beginning, during the week ended July 13th, a series of " Fuel Flashes " began in all cinemas. Two special exhibitions on fuel economy had recently been started and more were to be opened in the near future. A series of posters would shortly appear on hoardings throughout the country.

In the industrial sphere, which was certainly no less important than the domestic, the Fuel Efficiency Committee of his Department had been in close touch for the last nine months with all the big industries through their trade associations, and advisory committees were being set up in all regions, with panels of combustion experts whose advice would be available to all industrial consumers. The Committee's own staff of combustion engineers was also doing valuable work in this sphere. A training scheme had been inaugurated, with the collaboration of the Board of Education, at some 45 universities and colleges throughout the country; over 4,000 men received training under the initial scheme and it was likely that over 10,000 men will be trained as the scheme developed; the students were drawn from the engineering and boiler house staffs of industries. A memorandum on fuel economy was now being printed for circulation to some 30,000 factories.

Intensified Campaign

It was intended that the campaign should be intensified week by week until the climax was reached with the approach of the colder weather. It was essential that the campaign should be well thought out; it was not enough merely to tell people to save fuel. They were entitled to know exactly how to save and when, and it was his intention to give them all the help possible.

Mr. Petherick asked the Minister why he intended to implement the proposal that fuel overseers should withhold from householders a proportion of coupons in respect of the use of gas and electricity, in view of the fact that such a proposal, if enforced, would remove the right implicit under the Annex Plan of householders to spread their coupons in such proportions as they might think fit over coal, gas, electricity, etc., within the total ration.

Major Lloyd George said that a proposal on the lines of that described by Mr. Petherick was favoured by the gas and electricity industries, but provision would be made to allow householders to vary their consumption of different fuels. He had no present intentions in the matter. Any question of varying the plan in the Annex to the White Paper on Coal would not arise unless there were a decision to impose rationing and the Government would not bring any fuel rationing scheme into operation without prior intimation to the House and opportunity for debate if that should be desired.

In a written answer to a question Major Lloyd George states that six persons are engaged, either wholly or partly, in conjunction with other work at the headquarters of the Ministry of Fuel and Power, on the administrative preparations for the action which will be necessary if fuel rationing is introduced ; the cost is at the rate of approximately £3,000 per annum.

Efficiency in Government Factories

On July 30th, the Fuel Efficiency Committee discussed with the Government Departments concerned the question of fuel economy in Royal Ordnance Factories. The field covered was very wide and comprised every possible way of cutting out waste and of increasing efficiency in the generation and use of power and steam. A suggested poster for exhibition in Royal Ordnance Factories was agreed upon.

It was stated that the Royal Ordnance Factories had formed a small body of experts who were already going to individual factories and seeing that every possible means of fuel economy was practised. Already the savings effected had been appreciable and further substantial economies were expected. The suggestion was made that, owing to a shortage of qualified men, women might be trained in certain aspects of fuel economy. A further suggestion was that Works Production Committees should be approached with a view to their using their influence to secure fuel economy.

Cinema proprietors are taking steps to eliminate unnecessary lighting in their establishments. Instructions have been sent to 4,300 cinemas by the Cinema Exhibitors' Association to the effect that intervals when the auditorium lights are on should be curtailed and that the illumination should be cut by half. Purely decorative lighting should be discontinued and where there is sufficient daylight in foyers and entrances the lighting should not be used in the daytime.

In a letter to *The Times* Col. W. A. Bristow, M.I.E.E., vice-president of the Institute of Fuel, refers to the appointment of fuel economy officers in public utility and industrial undertakings and suggests that the idea should be extended to the home. The responsible person would discuss with the other members of the household means of saving fuel and a programme would be drawn up and displayed in prominent positions in the house. Col. Bristow mentions many ways of economising in the use of gas and electricity.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Southend Transport Committee has recommended the appointment of **Mr. W. Baxendale,** A.M.Inst.T., deputy general engineer to the Wallasey Corporation Motor Omnibus Department, as general manager of the Southend Corporation transport undertaking. Mr. Baxendale was formerly engineer to the Bournemouth Corporation Transport Department and before that held an appointment at Halifax.

Mr. W. H. Ellis, who is resigning his position as manager of the Chester Corporation transport undertaking as from October 1st, 1942, is being retained as consultant manager. In 1898 Mr. Ellis entered the service of the Electricity Department and in 1906 became assistant mains superintendent. He was appointed manager of the Transport Department in 1918.

Sir Louis Sterling has been elected President of the British Institution of Radio Engineers in succession to Dr. C. C. Garrard. He will deliver his address on September 25th. Dr. James Robinson has been elected vice-president.

Councillor W. S. Lewis, area secretary of the Electrical Trades Union, has been chosen to be the next Lord Mayor of Birmingham.

Mr. L. H. A. Carr, M.Sc., chairman of the North-Western Centre of the I.E.E. for the 1942–43 session, received his education at Blackpool High School and Rossall School and his engineering education at the Manchester School (now College) of Technology.

Mr. L. H. A. Carr

He obtained his workshop training with the Lancashire Dynamo & Motor Co., Ltd. (now Lancashire Dynamo & Crypto, Ltd.), with whom he became test-bed assistant, and subsequently assistant chief of test and assistant designer. In 1910 he joined the Electric & Ordnance Accessories Co., Ltd., as designer, but returned to the Lancashire Dynamo Co. in 1912 as chief assistant designer, which position he held until 1915 when he was appointed chief AC designer to the company. He went to J. H. Holmes & Co. in 1918 as chief designer (AC and DC), and in 1920 was appointed engineer of the Large Electrical Machine (Plant) Department of the Metropolitan-Vickers Electrical Co., Ltd., which position he still holds. He has done considerable work in connection with change of frequency, particularly in regard to collieries, and he also took a prominent part in the electrification of the Hungarian State Railways in 1932–33. From 1920 to 1940 he was part-time lecturer at the Manchester College of Technology on the theory of electrical machines and electrical design.

Mr. Carr has served on the Committee and later as hon. secretary of the North-Eastern Centre of the I.E.E., and has served on the Committee of the N.W. Centre, of which he was hon. secretary for seven years. He has contributed a number of papers to the *Journal* of the I.E.E. and was awarded the Ayrton Premium by the Institution in 1921–22. He is a member of the Association of Mining Electrical and Mechanical Engineers.

Mr. H. W. Green, who is the chairman of the North-Eastern Centre of the Institution of Electrical Engineers for the 1942–43 session, entered the service of the North Eastern Railway Co. as an apprentice in the locomotive works and completed his apprenticeship in the electrical section of the Chief Mechanical Engineer's Department. He was appointed draughtsman and test inspector, later becoming district electrical inspector in charge of the Darlington district. He served throughout the last war and was in France from April, 1915 to May, 1919, retiring with the rank of captain (R.E.).

Mr. H. W. Green

In December, 1920, he was appointed electric car sheds assistant to the works manager, Walker Gate, and in 1923 became superintendent of the new electric car sheds and repair shops at South Gosforth. He was appointed district locomotive sheds superintendent for the combined Middlesbrough and West Hartlepool district in 1933, and district electrical engineer, Newcastle, in 1934. In April, 1938, he became assistant electrical engineer, North-Eastern Area, the title being changed to electrical engineer, North Eastern Area, in 1941, on the formation of a separate Electrical Department.

In reporting the appointment of **Mr. P. Bregazzi** as borough electrical engineer of St. Helens in our issue of July 17th we gave the salary as £1,400. It is, in fact, £1,450 per annum.

South Shields Transport Committee has approved a salary increase of £50 for **Mr. H. J. Troughton,** the transport manager.

York Corporation Electricity Committee reports the retirement of **Mr. G. H. B. Holmes,** station superintendent, after forty years' service.

Mr. R. P. Wallis, Ph.D., M.Sc., has joined the board of Bennis Combustion, Ltd.

Mr. Hans Renold, founder and director of the Renold and Coventry Chain Co., Ltd., attained his 90th birthday on July 31st. This milestone in a long and eventful life has been marked by the employees of the company by the establishment of a fund to be known as the Hans Renold 90th Birthday Commemoration Fund, the annual investment income from which is to provide prizes for mechanical engineering students. The name of Renold will always be

associated with the pioneers of mass production to precision limits and his achievements in this field made possible the development of precision chains as a recognised medium of high-speed driving.

The report of the Telegraph Condenser Co., Ltd., for the past year shows that Mr. S. G. Brown, Mrs. Alice Brown, Dr. W. H. Eccles, Dr. F. C. Stephan, Mr. C. P. Allinson and Mr. C. T. Grimes have resigned from the board, and that Messrs. W. H. McFadzean and F. Waine havej oined it—the former as chairman.

Mr. S. Turner, C.A., has been appointed secretary-treasurer to Bepco Canada, Ltd., in succession to **Mr. S. E. Gladwell.** Bepco Canada, Ltd., is the Canadian subsidiary of Bruce Peebles & Co., Ltd., Crompton Parkinson, Ltd., the Harland Engineering Co., Ltd., and Lancashire Dynamo & Crypto, Ltd.

Mrs. Peggie Mackay has relinquished her post as E.A.W. housecraft lecturer and is taking up an appointment with Soya Foods, Ltd., as cookery adviser and chief demonstrator.

Obituary

Mr. E. H. Shaughnessy.—We regret to report the death of Mr. Edward Herbert Shaughnessy, O.B.E., M.I.E.E. late Chief Radio Engineer and Assistant Engineer-in-Chief of the G.P.O., which occurred on July 29th after a brief illness. Mr. Shaughnessy, who was seventy-one, was educated at the Haberdashers' School, Telegraphists' School of Science and the East London Technical College. He joined the telegraph service as an operator in 1887 and became a sub-engineer in the Engineering Department nine years later. He rose through the various grades, until, in 1925, he was appointed Assistant Engineer-in-Chief for the purpose of carrying out the Imperial Wireless scheme. He had been engaged in radio work since 1913 and was expert witness for the Crown in the action brought by the Marconi Co. for breach of contract in 1915. During the last war Mr. Shaughnessy evolved measures for the detection of illicit radio stations and later organised and controlled direction-finding stations for following the movement of enemy aircraft. He was awarded the O.B.E. for these services. As Chief Radio Engineer he was responsible for the erection of the Rugby radio station. He retired in 1931, since when he has acted as consulting engineer. For many years he served on the Council of the I.E.E.

The late Mr. E. H. Shaughnessy

Mr. F. B. O. Hawes.—It is with regret that we have to record the death of Mr. Frederick Benjamin O. Hawes, M.I.E.E., which occurred on July 28th at Torquay at the age of seventy-nine. He will be chiefly remembered for his work in connection with electrical trade organisation and trade associations, and for the services which he rendered to the Electrical Trades Benevolent Institution (now the Electrical Industries Benevolent Association) as hon. secretary over a long period.

Mr. Hawes left the position of secretary to the original Langdon-Davies Motor Co. to follow the late Mr. W. Davenport in the secretaryship of the National Electrical Manufacturers' Association, and while occupying that position acted as secretary of the electrical exhibition held by the Association at Olympia in 1911. It was about this time that Mr. Hawes resigned the secretaryship of N.E.M.A. which, in 1911, underwent reorganisation, and became B.E.A.M.A. with Mr. D. N. Dunlop as secretary.

In 1928 the E.T.B.I. appointed Capt. J. T. Keeping as secretary, as it was thought necessary to appoint a full-time official to cope with the greatly increased work of the Association, but Mr. Hawes consented to continue as hon. secretary. He retired from that position and from business early in 1929.

"A.H.B." writes:—It inevitably happens that when active service in any sphere is followed by prolonged retirement to an advanced age one's work is forgotten by some and unknown to many. F. B. O. Hawes filled a place of importance and usefulness in the industry many years ago, and it was my privilege through the *Electrical Review* to be for a time in close and continuous contact with him when some of us were using our knowledge of affairs and such influence as we possessed in organising the National Electrical Manufacturers' Association, running the first electrical exhibitions held at Olympia and Rusholme, and laying the foundations of the E.T.B.I.

My earliest meeting with Hawes was in pre-Association days (the Press was then the main organisation through which the industry acted) when a handful of electric motor and other manufacturers met privately in one of the basement offices at Winchester House to see how they could jointly counteract the influence of an electricity supply representative!

Although there are now amongst us few of our associates of those lean but very pregnant years, I am sure that those who do still linger in retirement will agree that we owe a great deal to our friend for what we endeavoured—and began—to accomplish in a period when the work of organisation was so full of difficulties and had to meet so much suspicion.

Mr. H. Tomlinson-Lee.—The death occurred on July 29th, after a long illness, of Mr. Harrie Tomlinson-Lee, M.I.E.E., M.I.Mech.E. Mr. Tomlinson-Lee was borough electrical engineer of Wimbledon for some years but relinquished that position in 1922 and took up a commercial post.

Mr. Davison Taylor, who had carried on an old-established business as an electrical engineer at Sunderland, has died at Witton-le-Wear, Co. Durham, at the age of seventy-two.

Coal Rationed in Ulster

UNDER the new coal rationing scheme which came into operation in Northern Ireland on August 1st consumers will receive 75 per cent. of their former annual supply certified by their coal merchants. The White Paper which sets forth the scheme in detail states that after taking a very close view of the general situation of heating and lighting for all purposes, it is not proposed to recommend any scheme of rationing of gas or electricity at present.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Institution Membership

FROM my critics one might infer that the young man at, say, 26 years of age who becomes a corporate member of the I.E.E. by virtue of passing an examination, and a recognised length of practical experience, just dies off at that early age, while the all-practical type over years of experience rises to great heights. Qualified engineers, as well as doctors, solicitors, barristers, accountants, secretaries, and other professional folk have merely wasted their time.

That an individual from an " over-forty " disgruntled class " has more to give the I.E.E. than the Institution has to offer him," is just funny. If certain persons have attained over years of experience such heights of merit, why bother to seek admission to the I.E.E., unless it is merely to obtain its diploma as a long term service medal?

Or should they, as is claimed, possess such a vast amount of practical knowledge to warrant admission, they will find that half of the examination papers contain only tests of a purely practical character; in the other half any intelligent grammar-school boy would find no real difficulty.

I can only hope that the I.E.E. diploma will still rank as the hallmark of engineering proficiency. If its future acquisition is to be by merely making out a good case in filling up an application form, it will soon not be worth the paper it is written on. If anyone has any doubt about this conclusion, I would advise him to investigate the requirements for admission to other professional bodies.

Eccles. EXAMINATION.

IN his letter published in your issue of July 24th, Mr. Baxter makes the point that the Institutions should more satisfactorily balance theoretical knowledge and practical experience. I would point out that the I.E.E. in its regulations for admission to corporate membership, does require the candidate to hold qualifications of both a technical and practical nature.

As regards the odd notion, which is at least tacitly expressed in some of the letters on this subject, that in general the " theoretical " man is less likely to become a good engineer than his " practical " brother, I would say that I cannot see any reason whatever why this should be so. If it should be so in particular cases, then it is surely an indictment of our method of training engineers, rather than of the desire of the Institution to restrict its upper grades of membership to those who, in addition to practical experience, have received definite technical training and have justified it by obtaining a recognised diploma. The value of technical training is not only in the actual facts learnt, but also, and perhaps more, in the training of the mind to grapple with problems and to attack and overcome difficulties, and so to fit it to meet all the situations, practical and theoretical, which crop up in actual industrial practice.

Finally, in my opinion, the whole matter is a question of professional status. If the Institution is to be a professional body and not merely a trade union, then I think it must insist on all-round qualifications from those aspiring to corporate membership.

Basingstoke. R. J. HARLEY, B.Sc., A.M.I.E.E.

THIS correspondence is interesting but much appears to be uninformed. The aims of the Institution should not be confused with the more selfish aspirations of its detractors.

As regards the service a man can render to science and engineering as a member, surely the young entrant, except in rare eases, is the greater asset. It is rare that a man with " 40 years' experience " wishes to enter the Institution to give genuine service, or even to advance his own knowledge of science. Is it not reasonable to suspect the motives of such an applicant unless his record of service is exceptional? What benefit men nearing the end of their industrial life can confer on the Institution is problematical. Are not most of them men, without scientific attainments, who have by ability or circumstance advanced themselves to commercial eminence and feel that their dignity needs " official recognition " and a place in the " seats of the mighty "?

The lot of the man about 40 who lacks full academic qualifications is another matter and one which the Council appears to treat with sympathy. Nevertheless, if a man is denied, perhaps only for a time, corporate membership with its implied professional status, he is not debarred from the activities and opportunities for service. At least as regards the East Midlands any man who has something worth while to contribute is welcome and the *Journal* shows clearly that the Council accepts papers without discrimination against any class of membership.

The requirements for corporate membership have been known for well over 25 years—that they have been reasonable is evidenced by the large membership. Border-line cases will always exist, but recent addresses by members of the Council show that this and

more vital matters are earnestly reviewed by some of them at least and that the Institution is still far from being a " water-tight association of academic brains."

Nottingham. EAST MIDLANDER.

THE revival of correspondence in condemnation of the I.E.E. is a proof that it must either put its house in order, or slowly fade out through its short-sighted policy of narrowly confining membership to a circle of academical bookworms.

The youth of our country to-day are either serving in H.M. Forces or actively engaged in work of national importance which prevents a leisurely perusal of out-of-date books. They are, nevertheless, gaining far more practical experience and ultimate knowledge than many a corporate member has ever achieved. The pioneers of electricity paved the way to the unlimited possibilities of a new and daring source of power, only to be hampered by a conservative and strictly guarded Institution which claims to be the experts of electrical engineering. Periodically numerous eminent engineers, who are non-members, strive to change the present very unsatisfactory state of affairs. It is doubtful whether the I.E.E. Council ever listens to the pleadings of those who have the industry at heart. It should encourage personnel from the electrical industry to join its ranks and admission should depend upon the actual engineering experience of candidates and upon the recommendation of fellow citizens whose integrity is already known.

The I.E.E. Council should carefully study the methods of the American I.E.E., which incorporates every electrical engineer of note within its ranks. May the efforts of " Midlands " and " Progress " bear fruit.

Sutton Coldfield. RECTIFIER.

Elastic Economics

ARE we short of rubber? You have reported the restrictions on the manufacture of rubber-insulated cables and other products and we are exhorted in Government advertisements to save every scrap of it. But if we are short of rubber, how is it that the public can still buy rubber hosepipe, mats, door-stops, shoes with crêpe rubber soles and an almost endless catalogue of articles which they could well do without in this time of emergency.

To commandeer the stocks of these articles without compensation would be unfair to their owners, but what is to prevent their purchase by the Government? If the tonnage is large the cost would likewise be large, but would an extra million pounds or two of war debt be worth worrying about in comparison with the risk of a lost battle due to vehicles immobilised for lack of rubber? The Germans were reduced in the last war to using springs on the wheels of lorries in place of tyres and I doubt very much whether Herr Schmidt can this time buy hosepipe to water his lawn.

Even if the tonnage were small, would not the effect on morale be worth while, as it somewhat damps the ardour for collecting scraps of rubber to see vastly greater amounts being frittered away in non-essential uses. If at present the price seems too high, would it not be prudent to hold up the consumption of these stocks until we have rounded the corner?

Mitcham. CABLE USER.

Co. Kerry Scheme

AS the reference in your July 24th issue (page 124) to the Cummeragh River, Co. Kerry, may have given rise to a misunderstanding, may I say that the work being carried out there by the Board is only for the purpose of providing facilities for the measurement of the flow in the river. It involves the erection of a small concrete weir, which will be provided with a fish pass.

Dublin. E. A. LAWLER,
Public Relations Department,
Electricity Supply Board.

[As we stated in our note, the information was published by the *Cork Examiner*.—Editors, *Electrical Review*.]

NEW BOOKS

The Calculation of Unsymmetrical Short-Circuits. By H. Rissik, Hons B.Sc.(Eng.), A.M.I.E.E., M.Amer.I.E.E. Pp. 55; figs. 22. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, London, W.C.2. Price 7s. 6d. net.

This book is an elementary study of the application of symmetrical component theory to the calculation of currents and voltages in faulted networks and it is confined to simple three-phrase systems. Symmetrical components are employed because the faults exemplified are other than three-phase faults, i.e., they are of the kinds which commonly occur in practice. Basic principles of the method are given together with expressions for the symmetrical impedance equivalents of different types of unsymmetrical faults. The reactions of a typical network to fault conditions are determined and the numerical calculations are given in detail so that the reader may the more easily follow the step-by-step application of the method employed in the analysis.

Spectroscopy and Combustion Theory. By A. G. Gaydon. Pp. 191; figs. and plates 11. Chapman & Hall, Ltd., 11 Henrietta Street, London, W.C.2. Price 17s. 6d.

Factory Lay-out Planning and Progress. By W. J. Hiscox. Pp. 195; figs. 46. Sir Isaac Pitman & Sons, Ltd.

The Machine Shop Yearbook and Production Engineers' Manual. Editor: H. C. Town. Pp. 559; figs. 412. Paul Elek Publications, Africa House, Kingsway, London, W.C.2. Price 25s.

The I.E.E. Council

Is It Really Representative?

By J. W. Thomas,
LL.B., B.Sc., M.I.E.E.

MEMBERS of the I.E.E. will have read with interest the notes in the July issue of the *Journal* on the above subject. They will probably think, however, that the claim that "the Institution is a democratic body in that its members formulate the laws which control their doings and elect from their members a Council to administer their affairs," may be true in theory but is not so true in practice. As one of the terms of reference of the Post-War Planning Committee is "to study and make recommendations as to any desirable changes in the structure and machinery of the Institution," a few comments on the constitution and methods of election of the Council may not be out of place, and may lead to constructive suggestions as to improvements.

One criticism which is frequently voiced by corporate members is that there is not sufficient representation on the Council of what might be described as "the rank and file" of the Institution. In the first place, it is preponderantly made up of full members and is not sufficiently representative of the associate member class which forms the largest section of the Institution. Under the present constitution there is provision for only four associate members out of a total membership of the Council of approximately 54. This total includes chairmen of local Centres in this country, but not past chairmen. If one deducts from this total a companion, an associate, and the four associate members, one is left with a figure of 48 full members, including the President, past presidents, four vice-presidents, honorary treasurer, chairmen of Centres, chairmen of Sections and twelve elected full members.

Mr. Thomas considers that the "rank and file" of the Institution are not adequately represented on the Council. He gives reasons for this and suggests means of removing grounds for criticism

Thus the ratio of full members to associate members on the Council is 48 to 4, whereas, according to the last annual report, there were 2,134 full members and 8,341 associate members in the Institution, a ratio of approximately 1 to 4. It is difficult to see how this disparity can be justified; it affords ample grounds for suggesting that the constitution should be amended so as to provide a bigger representation of associate members. The rule that chairmen of Centres must be full members also tends to give undue weight to the full membership class on the Council, and it might be desirable to consider whether it should not be relaxed.

Another criticism that is frequently made is that before a corporate member has a reasonable chance of election to the Council, he must have attained a high position in electrical engineering. That this is the case in practice is borne out by a glance at the present membership of the Council. It is no exaggeration to say that a large majority of them hold very high positions such as chief engineers or directors or, in the university world, as professors. Although the technical colleges do such valuable work in training young electrical engineers, apart from those which have university status, they have practically no representation on the Council.

There is a tendency for men to be chosen, not because of the interest they have displayed in the activities of the I.E.E., but by reason of the position to which they have attained. Whilst no one would wish to undervalue the worth of many of the present members, it does seem desirable that before persons are elected to the Council they should have given some indication of their practical interest in the affairs of the Institution by attendance at local Centre meetings, by their contribution to the discussions, or by membership of a local Centre committee. There have been cases where persons have been elected to the Council whose faces are rarely, if ever, seen at ordinary meetings and whose general interest in the work of the Institution has been almost negligible.

The most serious criticism, however, of the present constitution of the Council is that there is a disproportionately large representation of past-presidents; at present there are nineteen, and eighteen of them could be described as fairly regular attenders. There may be something to be said in favour of a House of Lords when it is a separate body, but even the strongest supporter of the present constitution would have hard work to justify the presence of the House of Lords in the lower chamber. It is true that a past-president of more than five years' standing has no vote unless he is on a committee, but most of them are, in fact, on committees and they usually exercise their votes.

It is not suggested that they have been put on to committees in order that they might have conferred upon them the right to vote, and no one denies that many of them make important contributions to the work of the Institution at the sacrifice of valuable time,

but that is not quite the point. What does disturb the average member is the fact that a large proportion of the Council is made up of men who are not democratically elected and who are sometimes out of touch with the opinions of the rising generation. It is reasonable to suggest that past-presidents should cease to be members five years after their year of office.

The method of election to the Council also leaves much to be desired. One is afraid that it has almost ceased to be a true election and has become practically a form of co-option. The Council nominates its candidates and in the large majority of cases these nominees are elected. Possibly the members of the Institution are to some extent to blame for this in that they do not take enough trouble to exercise their votes, but that state of affairs may be partly due to the fact that many members consider it to be a foregone conclusion that the Council nominees will be elected and, therefore, there is not much point in their voting.

A person nominated outside the Council has got to be particularly well known and have some very powerful support before he can hope to be elected against the Council's nomination, and he cannot seek such support himself as organised canvassing is deprecated. This criticism is put forward with all seriousness as to my knowledge it is frequently being voiced in the North. It would be asking too much to expect the average member to admit that the Council can choose his representatives better than he can himself, and it would, therefore, be a healthier thing for the Institution if elections were freer and definite encouragement was given to the younger men to come forward for election.

The average age of the members of the Council is above what it should be, as a glance round any typical Council meeting would undoubtedly show. This does not make for vitality but tends to increase inertia which is inimical to change. A larger sprinkling of younger men would do a power of good to the Institution as a professional body. The writer in the *Journal* must have had his tongue in his cheek when he said that the members formulate the laws which control their doings. As a matter of hard fact, the members know very little of the decisions of the Council as its minutes are private and confidential, and are not reproduced in the *Journal*.

Many members are beginning to suspect that one reason why the Institution does not do more for its members or exercise greater influence in the nation's affairs to-day is that it is not sufficiently democratic, that it is based too much on tradition and precedent, and that it does not allow sufficient scope for new energy and new ideas.

Liability for Repaired Goods

THE Director of the Electrical Contractors' Association (Mr. L. C. Penwill) has sent his members a memorandum approved by the Association's solicitors upon the liability incurred by electrical contractors and retailers when accepting articles for repair.

This states that owing to the present unsettled state of trade many contractors are finding it very difficult to gauge their liability to the public when they accept electrical appliances for repair. This is due in some measure to the difficulty of obtaining the necessary spare parts, delay in executing the work due to shortage of labour and the lack of adequate supervision in carrying out the work. It is not possible to lay down hard and fast rules regarding a liability of this kind as so much depends upon the facts of each individual case. There are, however, certain ordinary principles which, if borne in mind, may assist contractors to discern when they are and when they are not responsible to a customer for damage.

When a trader accepts an article for repair he becomes in law the bailee of that article and takes upon himself the duty to take reasonable care of it, in addition to the obligation to exercise reasonable diligence and skill in carrying out the repair. If it is lost or injured while in his custody he will be responsible for the full amount of the damage sustained if it can be shown that the loss or damage is the result of his failure to exercise this duty to take care.

Difficulty sometimes arises when the customer calls to collect his article and disputes the price which he should pay. If the cost of repair has not been agreed upon the contractor is, of course, entitled to a reasonable remuneration for the time, labour and skill which he has expended upon the repair of the article. If the customer does not pay the amount due the contractor has a lien on the article for payment of the amount. This means that he is entitled to retain possession until he is paid.

It sometimes happens that part of an article is left for repair and when the repaired part is reassembled into some other part of the composite article it shows a defect, and the customer will inevitably say that the fresh defect which has appeared is due directly to the repair which the contractor has executed to the other part. In the great majority of cases this would be an exceedingly difficult thing to prove and any claim which the customer might make would depend upon his ability to prove that reasonable skill had not been used in effecting the repair.

It has been suggested that contractors might adopt some means—such as notices posted in the showrooms or notices on the back of receipts given for the articles—of evading responsibility even for their own negligent acts. It is, of course, possible to make conditions of this kind, but only if they come to the notice of the customer at the time when the contract is entered into so as to be incorporated in and form part of the contract, but for various reasons this is a very unsatisfactory procedure.

COMMERCE and INDUSTRY

Skilled Men for Forces. Employing and Training Women.

Reservation of Contractors' Employees

A STATEMENT has been issued by the Director of the Electrical Contractors' Association in reply to many inquiries concerning the public announcements during the last week or two that operatives in the building and civil engineering industries are now subject to a reservation age of 41. In the last issue of the Schedule of Reserved Occupations such operatives were not the subject of any specific ages at the time but were governed by a special scheme. The announcement of the Ministry of Labour and National Service does not apply to electrical contracting operatives who under the Schedule are subject to dereservation at the rate of one year per month, commencing on January 1st, 1942. It is emphasised that any announcement referring to building and civil engineering operatives does not affect the electrical contracting industry.

Calling-up of Skilled Men

The Ministry of Labour and National Service has announced an amendment to the Schedule of Reserved Occupations. Unreserved and undeferred men in certain occupations who have hitherto been available for service in the Forces only as Service tradesmen will in future be called up for service as non-tradesmen if not required for service in a trade capacity. The occupations are among those included in the Schedule of Reserved Occupations with the symbol " ST " in the remarks column, and include the following:—Tester (wire rope, electric cable), test attendant (electric cable); meter tester (electricity supply); magneto maker, assembler (electrical engineering).

Labour Conditions in Plastics Industry

Award No. 229 which was recently made by the National Arbitration Tribunal stipulates that the employees in certain departments of the Mica Manufacturing Co., are entitled to terms and conditions of employment not less favourable than those covering that section of the plastics industry within the scope of the joint agreements between the Engineering & Allied Employers' Federation and the trade unions. The departments concerned are the following:—Bakelite moulding, finishing bakelite mouldings, machine shop and toolroom, micanite and bakelite tubes, pressed micanite sheet, micanite plate building, powder grinding and mixing and pure mica.

Women in Power Stations

The Joint Committee of Electricity Supply Associations recently discussed the employment of women in power stations, and the chairman (Lt.-Col. S. E. Monkhouse) suggested that if the industry was to obtain the men required for maintenance purposes it would be necessary to prove to the Ministry of Labour that women were being employed to the fullest extent throughout the electricity supply industry.

The Committee accordingly passed a resolution to the effect that in view of the present position of man-power in the industry the time had arrived when, in the national interest, the employment and, where necessary, the training of women for work in electricity undertakings, particularly in power stations, should be carried into effect by all undertakings to the maximum possible extent and as quickly as possible.

Roller Bearings Order

To secure the most equitable distribution for production usage of ball and roller bearings and to prevent over-stocking of such bearings, the Ministry of Supply has issued an Order which came into force on July 22nd, controlling the acquisition and stocking of bearings. Production usage of bearings means those instances where bearings are used in the production of any other article, and whether obtained direct from bearing manufacturers or through second parties. This Order does not affect bearings required for repair or maintenance of any other article. The Order, The Control of Ball and Roller Bearings (No. 2) Order, 1942, is obtainable, price 1d., from H.M. Stationery Office.

Henley's Works Councils

The summer issue of the " Henley Telegraph " appears without its familiar cover and the contents are somewhat more condensed than usual, but for all that the excellent standard of the matter is fully maintained. One page is devoted to some notes on the works councils which Henley's have set up. These comprise equal numbers of company's and employees' representatives, the latter being elected by all workers over 18 years of age. The subjects discussed by the councils cover a wide range, including such matters as war savings, canteens, overalls, travelling facilities, the elimination of waste and points relating to the health of the employees. Much good work is being done of benefit to both parties and, of course, to the nation.

Export Control

The Export Licensing Department of the Board of Trade has issued another of its periodical booklets giving a complete up-to-date list of goods the export of which is controlled under the Export of Goods (Control) (No. 28) Order, 1942. It shows the position as at July 15th and is prefaced with notes on trading with the enemy regulations, applications for licences, goods for which no licence is required, Customs regulations, etc. The publication can be obtained from the Stationery Office (9d.).

Kitchen Planning

At the request of the Ministry of Health Central Housing Advisory Committee Sub-Committee on the Design of Dwellings, the Association for Planning and Regional Reconstruction has prepared its first report on the kitchen in which it sets out the results of its investigations on kitchen planning. Parallel work has already begun on the water system of the house, and this will be followed by similar

work on the cleaning and heating of the house, and finally by some practical suggestions for a prefabricated plumbing system.

Women's Wages in Engineering

A claim for a minimum rate of 55s. a week for adult women has been presented to the Engineering Employers' Federation by the Transport and General Workers' Union and the National Union of General and Municipal Workers. This represents about 85 per cent. of the male labourers' rate and is a substantial increase upon the present minimum of 43s. a week. It is also asked that women on semi-skilled work shall be paid a higher amount and that the full male rate should be applied where there is no justification for difference.

Licensing of "Electrics"

Under a new Order by the Ministry of War Transport which comes into operation on September 1st, the running of all vehicles using fuels other than motor spirit or Diesel oil will be prohibited except under licence. Electric vehicles are included in this description. The object is principally to conserve rubber supplies.

Licences will be obtained from the Regional Transport Commissioners to whom applications should be sent giving registration and other particulars including the nature of the work for which the vehicles are used.

German Lamp Union

It was announced recently that practically all the German electric lamp manufacturing concerns were to be combined into a lamp union. *Reuter* now reports that the Reich Minister for Economic Affairs has drawn up instructions setting out the functions of the union.

The formation of the union provides possibilities for an extensive regulation of the marketing of electric lamps, and it will be responsible for planning and regulating production and sales. It will, in particular, promote an increase in production in the electric lamp industry and see to the quality of its products. The union will represent this branch of German industry in negotiations with foreign concerns.

Tin and its Uses

The current issue of *Tin and Its Uses* (No. 13) published by the Tin Research Institute is devoted to emergency economies in tin. It is explained that although in normal times the Institute's purpose is to develop new and improved uses for tin, this would be useless at the present time when a large proportion of the world's tin supplies is under enemy control. During the period of scarcity the Institute offers its services in the solution of tin economy problems and practical methods of saving tin in various fields of use are described.

Widow Awarded Damages

At the Manchester Assizes last week Mrs. Edith Wild, Davyhulme, claimed damages from Sir Lindsay Parkinson & Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd., in connection with the death of her husband, Peter Harold Wild, in January, 1941. The claimant's husband was a foreman fitter employed by the Metropolitan-Vickers Co. and was struck and killed by a falling beam while employees of Sir Lindsay Parkinson & Co. were demolishing a roof. Mrs. Wild alleged that the defendants had been negligent and had failed to take the necessary safety precautions.

Judgment was given for Mrs. Wild to the amount of £3,182 against Sir Lindsay Parkinson & Co. but the claim against the Metropolitan Vickers Co. was decided in favour of the company, costs being awarded against the other defendants. £500 from the award was allotted to a son of the deceased man by his first wife.

Fatality

At an inquest at Padiham last week on Mrs. Ethel Knowles it was stated by a witness that she and Mrs. Knowles were examining an electric iron. The witness was called away and shortly afterwards heard a scream and returned to find Mrs. Knowles lying on the floor with part of the iron in one hand, which was burned.

An engineer of the Lancashire Electric Power Co. said that the plug socket was badly adjusted and Mrs. Knowles had evidently made a circuit by holding the connector in one hand and touching the iron with the other.

A verdict of "Accidental death" was returned by the Coroner.

Radio Engineers' Meetings

The Programme Committee of the British Institution of Radio Engineers has now completed its arrangements for the whole of the London Section meetings from September next to May, 1943. At the first meeting on September 26th a paper on "Modulation" is to be submitted by Mr. J. Robinson, D.Sc., M.I.E.E., and on October 23rd Mr. L. H. Bedford, M.A., is to read a paper on "Time Units." Programmes of meetings are also being arranged by the North-Western, Midland and South-Western sections of the institution.

North-Eastern Students

August 16th is the date of this year's outing of the North-Eastern Students' Section of the I.E.E. The members are going to the Roman Wall: they are asked to take lunch with them but arrangements are being made for a high tea. Those wishing to attend should notify Mr. B. Collingwood, 6, Prendwick Avenue, Hebburn, by August 10th, at the same time enclosing 3s. for tea.

The Section's summer sports meeting is to take the form of a tennis match on August 12th, against the North-Eastern Electric Supply Co., at the company's sports ground, Wallsend. The next works visit will be to the Reyrolle short-circuit testing station on September 26th.

Kitchen Front Anniversary

It is two years ago since the first Kitchen Front Club was formed; it was at Thetford under the auspices of the East Anglian Electric Supply Co., Ltd. (Edmundsons). To mark the second anniversary a meeting attended by 200 people was held at Thetford on July 30th, under the chairmanship of the Mayor (Councillor H. W. Watling) who was supported by the Mayoress, Mrs. F. M. Ingillson, Mrs. Barbara Callow, M.A., Miss Hargreaves (Ministry of Food) and Mr. S. Watson (East Anglian Co.).

The Mayor spoke of the good results of the Kitchen Front movement which now had over a hundred branches and testified to the important

part played by electric cooking. He introduced Mrs. Ingillson who gave a useful talk and was thanked by the Mayor and by Mr. Watson who expressed appreciation of the efforts of Miss Ward who gave the first Kitchen Front demonstration.

All the Edmundson Companies now have Kitchen Front Clubs which are doing much useful work.

Action Against Liverpool Corporation

At Liverpool Court of Passage on July 29th, Thomas Hamilton, Liverpool, claimed damages from the Liverpool Corporation in consequence of loss sustained in a fire, alleged to be due to the negligence of servants or agents of the Corporation in installing electrical equipment.

Plaintiff occupied a house rented from the Corporation and there was an agreement respecting the electricity service. A fire occurred near a cupboard containing the main switch fuses and the meter, causing damage to the amount of £186. The defence was that there was no negligence and that the Corporation owed no duty to plaintiff with respect to the electric wiring or electricity supply and that it was not responsible for the supply or maintenance of any service lines, wires, lamps or other appliances on private property which should be paid for and maintained by the consumer. Judgment was given for the Corporation with costs.

Lamp Packing Wanted

The Electric Lamp Manufacturers' Association draws attention to the need for taking care of lamp packing material and returning it to the makers after use. Bulk containers should be returned promptly to the nearest depot of any E.L.M.A. member or handed to the carman making deliveries.

E.A.W. Certificates for Demonstrators

The fifteenth E.A.W. Certificate examination for demonstrators and saleswomen was held on June 18th. This was the third examination to be held during the war, and in spite of the present difficulties forty-two candidates sat for the examination at various centres throughout the country. Of these thirty-five were successful in obtaining the certificate, seven of them with distinction. This brings the total number of holders of the certificate to 857. The next examination will be held in June next year.

Increased Output

In last week's leading article it was stated that there had been an increase of 34 per cent. in the output of electricity in this country in 1941. Actually that increase had occurred since 1938. Industrial consumption in 1941 showed an increase of 62 per cent. as compared with 1938.

Control in New Zealand

The *New Zealand Electrical Journal* reports that under the Building Construction Control Notice, No. 12, restrictions are placed on the use, sale and disposal of electric cables. The notice applies to all types (flexible or otherwise) except hard-drawn copper overhead conductors, underground electric supply cables, telephone wires and cables and cotton-covered, silk-covered, asbestos-covered or enamelled wire. Owners of cables to which the notice applies must obtain the consent or direction of the Building Controller before using or disposing of cables. Further, owners or holders were required to forward particulars of their stocks of cables, and the jobs for which they were intended, to the Building Controller.

Several control notices affecting the use of iron and steel, machine tools and engineering equipment have also been published.

Change of Address

The address of the New Insulation Co., Ltd., is now 40, Broadway, Westminster, London, S.W.1.

TRADE MARK APPLICATIONS

AMONG recent applications for British trade marks are the following, objections against which may be entered within a month from the dates stated.

July 22nd

CORRONIZED (design). No. 615450, Class 9. Scientific apparatus and parts thereof ; electrical wires and cables ; telegraphic, teleprinting, measuring and signalling apparatus and instruments ; cash registers ; calculating machines and parts thereof; electric vacuum cleaners and parts thereof ; thermostats and thermostatic elements. — Standard Steel Spring Co., 843, Fourth Avenue, Coraopolis, Pennsylvania, U.S.A. Address for service : Stevens, Langner, Parry & Rollinson, 5–9, Quality Court, Chancery Lane, London, W.C.2.

TENAPLAS (design). No. 618675, Class 17. Insulating material. Tenaplas, Ltd., 7, Park Lane, London, W.1.

July 29th

SUNBEAM (design). No. 614270, Class 9. Electrical apparatus for brewing coffee.—Chicago Flexible Shaft Co., Chicago. Address for service: Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

PALLADOR. No. 618491, Class 9. Thermo-electric elements, being thermocouples. — Johnson, Matthey & Co., Ltd., 78, Hatton Garden, London, E.C.1.

DURACABLE. No. 619,066, Class 9. Insulated electric cables.—Duratube & Wire, Ltd., 16, Hanworth Road, Feltham, Middx.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following :—

SYRENE hairdryers.

ELECTRICITY SUPPLY

Rural Extensions Urged. Abolition of Minimum Charges.

Ashbourne.—MEMBERSHIP OF J.I.C.—The Electricity Committee has recommended the U.D.C. to make application for membership of the District Joint Industrial Council No. 7 (East Midland Area) for the Electricity Supply Industry.

Birkenhead.—MAINS.—The Electricity Committee is seeking sanction to borrow £3,500 for mains and services.

Bolton.—SUSPENSION OF MINIMUM CHARGES.—The Electricity Committee on July 30th decided to suspend for the war the clause imposing a minimum charge of 30s. a year on consumers. Thus all consumers will be charged only for electricity used.

Corby (Northants).—STREET LIGHTING. — A system of "starlight" street lighting is to be installed at Corby and operated from September to April inclusive.

Derby.—LEVEL OF WEIRS.—The Town Council has notified the Trent Catchment Board that it objects to authority being given to the British Celanese Co. and the Derbyshire and Nottinghamshire Electric Power Co. to raise the level of weirs on the River Derwent near their works owing to the increased danger of flooding.

Dumbarton. — ELECTRIC LIGHTING NOT ALLOWED.—As the Department of Health has refused consent for the installation of electric lighting at Dumbarton Joint Hospital at an estimated cost of £700 alternative schemes are to be considered by the Hospital Board.

Durham.—OVERHEAD LINE.—The County Council has approved proposals by the North-Eastern Electric Supply Co., Ltd., to erect an overhead line over the Manor Farm, Hart.

Guildford. — EXTENSION. — The Electricity Committee is to provide a supply to new premises at a cost of £708.

London.—SOUTHWARK.—Application is being made by the Electricity Committee for sanction to borrow £500 for meters.

The Works Committee has arranged for the Electricity Department to re-wire the Manor Place depot at an estimated cost of £335.

Ludlow. — RURAL SUPPLIES. — Mr. E. Burgoyne, divisional manager of the Shropshire, Worcestershire and Staffordshire Electric Power Co., attended a meeting of the Rural District Council recently to answer questions regarding the company's post-war plans for electricity supplies in rural areas. The S.W. & S. Co., he said, according to a report in the *Hereford Times*, was carrying out a survey of the whole of this area which covered approximately 4,500 square miles. When tackling the question of development it could not formulate a scheme for just one corner. It hoped to get useful information of the villages which needed supplies and of the potential revenue on the capital outlay.

Major A. W. Barrett asked whether it was the policy of the company to benefit the community and make electricity available for the rank and file. In the Ludlow district, which was entirely agricultural, there were cases where people should have the advantage of electricity, and he mentioned particularly farms, schools and vicarages.

Mr. Burgoyne replied that his company was in the forefront as far as rural development was concerned, and from what he knew there was no reason to believe that development would be any less rapid after the war than before. It was the company's aim and wish to serve every hamlet in the area, but rural development had been, and still was, a knotty problem.

Mr. F. P. J. Childs said that when he and a neighbour wished for electricity they had to put down £500 to have it brought to them. He thought that everyone ought to combine over the the question of rural supplies. The County Councils' Association had already taken up the matter strongly, and the Rural District Councils' Association and the Farmers' Union should do the same.

Mr. Burgoyne said that the company had already connected quite a number of farms in this area, and they had also made isolated tappings. It was his private opinion that farmers did not make enough use of electricity when they had it.

Mr. Childs claimed that as agriculture was very important to-day, it was desirable that farms should have electricity. He moved that strong representation should be made through Mr. Burgoyne to the company for the supply to be made available. The resolution was carried, and it was also decided to raise the matter at the county branch of the Rural District Councils' Association.

Maryport.—BAN ON WATERWORKS PLANT.—The Ministry of Health has informed the Urban District Council that in the present emergency it cannot approve the installation of electric motors at the waterworks pumping station. Further representations are to be made to the Ministry on the subject.

Nelson. — DOMESTIC MINIMUM CHARGES ABOLISHED.—The Electricity Committee has decided to abolish minimum charges on all domestic tariffs, whether two-part or flat rate, as from the September meter readings.

Nottingham.—PRICE REDUCTION CONFIRMED.—The reduction in charges recommended by the Electricity Committee was confirmed by the City Council last week. Mr. J. Littlefair criticised the proposal on the grounds that it would entail a loss of £24,000. Mr. F. Carney said that there was as much reserve as the undertaking required, or more, and it was their strong view that the money should be handed back as soon as possible to the people from whom it was collected.

Overseas

Eire.—DISCONNECTIONS FOR EXCESS CONSUMPTION.—A statement by the E.S.B. records that in the Dublin district, where systematic checks and comparisons with last year's consumption are in progress, 140 consumers have already had their electricity supply cut off for failing to economise.

New Zealand.—LOAN FOR EXTENSIONS.—The Waitemata Electric-Power Board is raising a loan of £50,000 for additional distribution lines in the district.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Ward & Goldstone, Ltd., show a trading profit of £59,995 for 1941-42 after meeting all general charges, E.P.T., income tax, etc., as compared with £49,069 for 1940-41. The net profit after providing for employees' provident fund, directors' fees, depreciation, etc., is £40,177 (against £36,259). A final ordinary dividend of 10 per cent. is paid, again making 20 per cent for the year. General reserve receives £25,000 and £34,048 is carried forward.

In a statement issued with the report Mr. M. H. Goldstone (chairman) says that the output for the year has been well maintained and in spite of unpropitious conditions the company has been able to continue essential supplies to many countries overseas thus maintaining continuity for post-war trade. This year marks the company's jubilee and to celebrate it the directors have decided to distribute £1,000 to local hospitals and charities. It was intended to distribute a bonus to the ordinary shareholders but the scheme had to be withdrawn in compliance with the ruling of the authorities.

The Philco Radio & Television Corporation of Great Britain, Ltd., reports trading profits for the year to March 31st of £126,292, as compared with £100,708 for the preceding fifteen months, and a net revenue of £96,105 (against £77,210). Expenses on sinking fund certificates were £1,874 and notes discount, etc., £600, leaving £93,631, which reduces the debit balance from £227,125 to £133,494. During the year the arrears of preference dividend and dividends accruing to March 31st, together with the capital redemption fund obligation, were cancelled, and £60,000 6 per cent. cumulative sinking fund certificates were issued in lieu thereof. The articles provide for a 5 per cent. cumulative sinking fund for redemption of the certificates.

Broadcast Relay Service, Ltd., reports a revenue of £164,548 for the year to March 31st, an increase of £63,434 as compared with the previous year. The net profit is £107,037 (against £51,569) and it is proposed to pay a final dividend of 5 per cent., again making 10 per cent., less tax, for the year on the ordinary capital. The balance carried forward is £82,636, as compared with £20,921 brought in.

McMichael Radio, Ltd., reports that after providing for depreciation and all charges the profit for 1941 is £31,091, as compared with £25,927 for 1940. Taxation requires £17,500 and the remaining £13,591 reduces the debit balance from £25,422 to £11,831.

Palestine Electric Corporation, Ltd.—Presiding at the annual meeting held on July 29th Viscount Samuel (chairman) said that sales of electricity during the year under review were nearly 10 per cent. greater than in the previous year, and the gross revenue nearly 23 per cent. higher. There was, nevertheless, a decrease of more than 3 per cent. in the number of consumers, due partly to black-out restrictions, but mainly to the introduction of a two-part tariff for domestic supply. This caused a number of small consumers to discontinue the use of electricity, but the effect on the revenue was negligible.

The Madras Electric Supply Corporation, Ltd., reports a revenue for 1941 of £145,687, as compared with £133,617 for the preceding year, and a net profit of £41,315 (against £48,496). The final ordinary dividend is 2½ per cent., again making 4 per cent., free of tax, for the year and the balance carried forward is £33,868 (against £41,330 brought in). The sales of electricity during the year totalled 57.6 million kWh, as compared with 51.5 million kWh in 1940.

The Telegraph Condenser Co., Ltd., reports a profit for 1941 of £40,387, as compared with £41,372 for 1940. The ordinary dividend for the year is maintained at 5 per cent., less tax, and £24,816 is carried forward, an increase of £5,155.

The Metropolitan Electric Supply Co., Ltd., has declared an interim dividend on the ordinary stock of 3 per cent., less tax (unchanged).

The Greengate & Irwell Rubber Co., Ltd., is again paying an interim dividend of 1s. per share.

New Companies

Halifax Wiredrawing Die Co., Ltd.—Private company. Registered July 25th. Capital, £2,500. Objects : To carry on the business of manufacturers and renovators of, and dealers in, dies for wire drawing and other purposes, manufacturers of, and dealers in, radio, television, telephone and electrical equipment and supplies, etc. Subscribers : F. Dawtrey, 28, Albert View, Halifax and W. J. Perry, 3, King Cross Street, Halifax. Solicitors : Storey, Perry & Akroyd, Halifax.

Plyformers, Ltd.—Private company. Registered July 25th. Capital, £2,000. Objects : To carry on the business of manufacturers of, and dealers in, plastic modelling, and moulding materials, wireless, radio and scientific instruments, rubber, gutta percha and vulcanite and goods made therefrom, etc. Directors : W. Doherty, 31, Harboro' Road, Sale, Cheshire and R. Faulkner, 6, Park Lane, Salford. Registered office : 87, Cross Street, Sale, Cheshire.

Companies' Returns

Statements of Capital

Clifford & Snell, Ltd.—Capital, £5,000 in 3,900 ordinary shares of £1 each, 4,000 deferred ordinary shares of 5s. each and 4,000 deferred "A" shares of 6d. each. Return dated April 25th. 3,338 ordinary, 4,000 deferred ordinary and 4,000 deferred "A" shares taken up. £4,188 paid. £250 considered as paid. Mortgages and charges: Nil.

Midland Electric Manufacturing Co., Ltd.—Capital, £225,000 in 75,000 7½ per cent. cumulative preference and 150,000 ordinary shares of £1. Return dated April 14th. All shares taken

up. £85,000 paid on 25,000 preference and 60,000 ordinary shares. £140,000 considered as paid on the remainder. Mortgages and charges: Nil.

City of Buenos Ayres Tramways Co. (1904), Ltd.—Capital, £1,240,000 in £5 shares. Return dated May 7th. All shares taken up. £1,240,000 considered as paid. Mortgages and charges : £93,205.

Chasetown & District Electricity Co., Ltd.—Capital, £100,000 in £1 shares. Return dated April 30th. 63,130 shares taken up. £1,000 paid. £62,130 considered as paid. Mortgages and charges: Nil.

Seaton & District Electric Light Co., Ltd.—Capital, £50,000 in 50,000 shares of £1 each. Return dated May 6th, 1942. All shares taken up. £50,000 paid. Mortgages and charges: Nil.

International Hydro-Electric Development Syndicate, Ltd.—Capital, £10,000 in 10,000 ordinary shares of £1 each. Return dated January 12th (filed May 9th). 2,844 shares taken up. £2,844 paid. Mortgages and charges: Nil.

Electric Heaters, Ltd.—Capital, £100 in 100 shares of £1 each. Return dated May 11th. All shares taken up. £100 paid. Mortgages and charges: Nil.

Interohm Electrical Insulators, Ltd.—Capital, £45,000 in £1 shares (36,000 preferred ordinary and 9,000 ordinary). Return dated May 13th. All shares taken up. £36,000 paid. £9,000 considered as paid. Mortgages and charges: Nil.

J. R. Halliwell, Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated February 2nd. 875 shares taken up. £875 paid. Mortgages and charges: Nil.

Electrical & Radio Installations Co. (Surrey), Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1 each. Return dated April 2nd. All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges: Nil.

Machynlleth Electric Supply Co., Ltd.—Capital, £7,000 in £5 shares. Return dated April 13th. All shares taken up. £7,000 paid. Mortgages and charges: £1,614 12s. 5d.

North Metropolitan Power Station Co., Ltd.—Capital, £100 in 100 ordinary shares of £1 each. Return dated April 14th. All shares taken up. £100 paid. Mortgages and charges: £4,952,633.

Egyptian Power Syndicate, Ltd.—Capital, £10,000 in 10,000 shares of £1 each. Return dated January 9th (filed May 15th). 2 shares taken up. £2 paid. Mortgages and charges: Nil.

Electrical Agencies (London), Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated May 16th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Automobile Electrics, Ltd.—Capital, £500 in £1 shares. Return dated May 17th. 225 shares taken up. £225 paid. Mortgages and charges at date of return: £600. A further £600 debentures were issued on July 3rd.

Paignton Electric Light & Power Co., Ltd.—Capital, £100,000 in 100,000 ordinary shares of £1 each. Return dated May 26th. All shares taken up. £60,000 paid. £40,000 considered as paid. Mortgages and charges: Nil.

Chepstow Electric Lighting & Power Co., Ltd.—Capital, £27,000 in £1 shares. Return dated May 28th. All shares taken up. £23,095 paid. £3,905 considered as paid. Mortgages and charges : Nil.

Electronic Devices, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1939 (filed May 21st, 1942). All shares taken up. £100 paid. Mortgages and charges : Nil.

Wellingborough Electric Supply Co., Ltd.—Capital, £50,000 in £10 shares. Return dated May 26th. All shares taken up. £50,000 paid. Mortgages and charges: £40,000.

Northern Electric Wire Co., Ltd.—Capital, £100 in £1 shares. Return dated January 1st (filed May 27th). 3 shares taken up. £3 paid. Mortgages and charges: Nil.

Mortgages and Charges

West Wales Wireless Relay, Ltd.—Satisfaction in full on July 14th, 1942, of debentures, authorised June 19th, 1940, and registered June 28th, 1940, securing £400.

Welding Progress

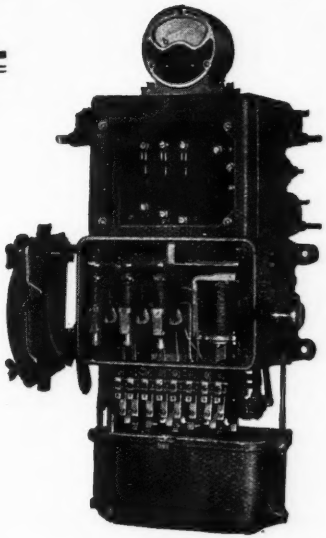
A FIVE-YEAR review of the work of the Welding Research Council, together with a financial statement giving particulars of revenue from different sections of the industry and pro rata grants made by the Department of Scientific and Industrial Research is included in the fifth progress report (price 5s.) of the Institute of Welding, 2, Buckingham Palace Gardens, Buckingham Palace Road, London, S.W.1.

Regarding the general activities, projected and outstanding, of the several research committees, the outbreak of hostilities caught many of them at the reporting stage of their work. Some disorganisation has been inevitable, due to concentration upon the war effort. For instance, little additional work on the resistance spot welding of stainless steels is at present in hand, since more interest is now attached to the use of light alloys in aircraft. Nevertheless, "stored energy" machines have been investigated, spot welding has been compared with riveting, tension tests have been made on spot welds and the effect of humidity on porosity has been studied.

During the year ended March last most of the research sub-committees continued their work and some reports and memoranda have been issued. The weldability of various metals continues to be studied ; exploratory experiments on the cracking of ferrous weld metal and of the adjacent hardened zone are proceeding, the schedule including examination by the X-ray diffraction method. Investigations into the weldability of aluminium and its alloys have been extended to include the metallic arc process.

A draft memorandum on copper welding technique has been prepared. The large amount of materials required for investigating welded constructions caused most of this work to be postponed, though there has been continuation in respect of ships' structures. It has not been possible to continue experimental work on pressure vessels ; it is desired to standardise the method of taking radiographs before their interpretation can be considered.

CONTROL by



VERITYS LTD.

ASTON, BIRMINGHAM 6

Sales Headquarters :
BRETTENHAM HOUSE, LANCASTER PLACE, W.C.2

Oil Immersed
Star-Delta Starter

FOR TRUING COMMUTATORS

MARTINDALE COMMSTONES

Cut copper, brass and steel without clogging. Edges of every bar left clean; no dragging of copper. Save 75% of time and cost of turning commutator in lathe. Give longer life to motors, etc.

Over 50 sizes always in stock, in 3 grades: coarse, medium and fine. 20 different types of handle.

Over 25,000 regular users all over the world.

MARTINDALE ELECTRIC CO. LTD., Westmorland Road, LONDON, N.W.9

Telephone : Colindale 8642-3
Telegrams : Commstones, Hyde, London

INSULATED WIRES, CABLES FLEXIBLES

FOR

- LIGHTING
- HEATING
- RADIO
- AUTOMOBILE
- AIRCRAFT
- BELL
- TELEPHONE
- HEATER CORDS
- ANTI-STATIC
- METAL SCREENED
- Varnished SWITCH BOARD
- LIFT
- SHOT FIRING
- PUSH BACK CONNECTING
- COTTON, ASBESTOS and SILK COVERED
- CABLE ASSEMBLIES

"Goltone" REGISTERED

DEPENDABLE ELECTRICAL ACCESSORIES

- LAMPHOLDERS
- HAND LAMPS
- SOCKETS
- WALL PLUGS
- CEILING ROSES
- ADAPTORS
- OPAL & other SHADES
- BELLS
- TRANSFORMERS
- SWITCHES
- MORSE KEYS
- JOINT BOXES
- CONNECTORS
- IRONCLAD PLUGS
- IRONCLAD SWITCHES
- IRONCLAD SWITCH PLUGS
- TABLE LAMPS

DELIVERIES

WE GIVE A LIST OF SOME OF OUR PRODUCTS.

DELIVERY OF MOST OF THESE LINES CAN BE MADE FROM STOCK OR WITH REASONABLE PROMPTITUDE IF ESSENTIAL EVIDENCE OF PRIORITY FOR NATIONAL SERVICE BE PROVIDED

A.I.D. FULLY APPROVED

London Depot:
5 Percy Street
W.1
Tel.: Museum 8371/2

Ward & Goldstone
PENDLETON MANCHESTER Ltd.

Telephone:
PENdleton 2442/6
Telegrams:
"MULTUM"
Manchester

ESTABLISHED 1892

STOCKS AND SHARES

TUESDAY EVENING.

THE Government has announced that it has no intention of withdrawing at present the 2½ per cent. National War Bonds which are "on tap." This came as something of a surprise, it having been generally expected that the current issue would be replaced, this month, by another that offered less favourable terms to lenders. On this expectation, prices of gilt-edged stocks have been steadily advancing: a slight decline followed the Government's statement. So far as the prior-charge stocks of the London Passenger Transport Board and similar bodies are concerned, no quotable alterations have occurred, but the markets for front-rank preferences are scarcely so firm as they were.

Home Railway Dividends

The Home Railway companies have all declared their interim dividends for 1942 and the results are practically the same as had been anticipated. The London Passenger Transport Board is paying 1¼ per cent. on its "C" stock, against 15s. a year ago. For the year 1941 a dividend of 2⅞ per cent. was paid last February. It is rather hoped that in respect of 1942 the Board will be able to distribute 3 per cent.; that is, a further 1¾ per cent. six months hence. The price of the stock has not recovered yet from the announcement that any saving which may be effected by conversion of the Board's T.F.A. 4½ per cent. stock into a lower-interest-bearing security will bring no benefit to the holders of the stock.

The Home Railway market as a whole is still far from popular with the ordinary investor. The latest demands of the men for higher wages are not conducive to confidence. Southern 5 per cent. preferred at 65 ex dividend is 1 lower. The company's 4 per cent. debenture keeps firm at 107, which is a point above the price of the 5 per cent. preference stock.

Fuel Rationing

The discussions about coal and fuel rationing, taken in conjunction with exhortations to economise, might have been expected to exert an unfavourable effect upon the prices of ordinary shares in companies concerned with the industries. In point of fact, the prices of stocks and shares in these companies have hardly suffered at all. Some people seem to think that as, in times past, certain of the supply companies have been benefited rather than the reverse by increases in the price of coal, so at the present time, although conditions are abnormal, no unfavourable effect will be produced upon their profits. The dividends, it is thought, will be carried on at the same rates as usual. So far from there being any pressure to sell, the market for electricity supply shares is very hard. In the case of some of the issues, jobbers in that market will deal only upon condition that a buyer will not press for shares, but will allow the seller a certain amount of latitude in the time for making delivery.

Five Thousand Henley's

In these days of scarcity of stock, it is unusual to come across any line of what may be called gilt-edged ordinary shares. This makes it the more worth while to mention that at the moment 5,000 W.T. Henley's Telegraph Works ordinary stock units of 5s. each have come on offer in the market at 22s. 3d. The company is, of course, one of the best in its class, as the modest yield of 4½ per cent. on the ordinary shares testifies. If it be asked why investment will pay prices at which the return on the money is but small, the answer is that the Government policy of cheap money, and closure of the new issue market, have forced up the prices of investments to levels which may appear to be unduly high. Nevertheless the consistent tendency is for prices to go better, and these 5,000 shares are not likely to be long in finding a home.

Anglo-Argentine Trams

Anglo-Argentine Tramways stocks and shares relapsed sharply on the chairman's speech at last week's meeting. Sir Bernard Docker then gave the unpleasant news that the Control Commission of Buenos Aires had refused consent to the adjustment of fares and reorganisation of services. The Commission says that the company can, and the company says that it cannot, make a profit without the raising of fares. The Argentine Minister of the Interior has been appealed to for an official decision. Meanwhile the prices of the company's issues are flat.

Price Fluctuations

Lord Hirst at last week's meeting of the General Electric Co. confirmed the previous impression that the company is in a strong position financially and prospectively, the latter as regards the outlook for business after the war. The price of the shares is unchanged at 80s., but the 6½ per cent. preference at 33s. 9d. are ⅛ better. Manufacturing shares in this group are steady without showing any particular change in prices. Dividends are satisfactory. Reports and accounts show that companies are, as a rule, doing well but that their profits are severely bitten into by E.P.T. A good deal of business is taking place in the shares of companies connected with the wireless industry. E. K. Cole shares have further risen to 14s., and a number of others in this section show small rises. Brush ordinary at 6s. are a little better.

(*Concluded on page* 191)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Aug. 4	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	51/3	−1/6	4 17 6
British Power and Light	6	6	28/–		4 5 9
City of London	7	7	27/6		5 1 9
Clyde Valley	8	8	40/–		4 0 0
County of London	8	8	36/3	−9d.	4 8 6
Edmundson's:					
7% Pref.	7	7	31/6		4 1 2
Ord.	6	6	28/–		4 5 9
Elec. Dis. Yorkshire	9	9	42/–		4 5 9
Elec. Fin. and Securities	12½	12½	48/9		5 2 6
Elec. Supply Corporation	10	10	45/–		4 9 0
Isle of Thanet	2	Nil	11/3		—
Lancs. Light and Power	7½	7½	34/6		4 7 0
Llanelly Elec.	5½	5½	22/6		4 17 9
Lond. Assoc. Electric	4½	4	19/6		4 2 1
London Electric	6	6	25/–		4 16 0
London Power Red. Deb.	5	5	105½		4 14 7
Metropolitan E.S.	8	8	35/9		4 9 6
Midland Counties	8	8	38/9		4 2 6
Mid. Elec. Power	9	9	42/–		4 5 9
Newcastle Elec.	7	7	28/9		4 17 5
North Eastern Elec. Ordinary	7	7	31/3		4 9 7
7% Pref.	7	7	34/–		4 2 4
Northampton	10	10	47/–		4 5 1
Notting Hill 6% Pref. (£10)	6	6	9		—
Northmet Power:					
Ordinary	7	7	34/6	−1/6	4 1 2
6% Pref.	6	6	31/–		3 17 5
Richmond Elec.	6	6	25/–		4 16 0
Scottish Power	8	8	38/9		4 2 9
Southern Areas	5	5	20/–		5 0 0
South London	7	7	26/6		5 5 8
West Devon	5	5	22/6		4 9 0
West Glos.	4½	3½	20/–		3 10 0
Yorkshire Elec.	8	8	40/–		4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/3		—
Calcutta Elec.	7*	7*	25/–		5 12 0
Cawnpore Elec.	10	10	26/3		7 12 4
East African Power	7	7	27/–		5 3 8
Jerusalem Elec.	7	5	17/6		5 14 4
Kalgoorlie (10/–)	7½	5	7/6		6 13 4
Madras Elec.	6*	4*	18/9		4 5 4
Montreal Power	1½	1½	24½		6 2 5
Palestine Elec. "A"	Nil	4*	21/3		3 15 3
Perak Hydro-elec.	6	7	7/6		—
Shawinigan Power	83cts.	90cts.	14½	+½	—
Tokyo Elec. 6%	6	6	13½		—
Victoria Falls Power	15	15	72/6		4 2 8
Whitehall Inv. Pref.	5	5	15/9		6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Aug. 4	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110½		4 10 6
1955–75	5	5	115		4 7 0
1951–73	4½	4½	107½		4 3 7
1963–93	3½	3½	103½		3 7 8
1974–94	3¼	3¼	99½		3 5 4
London Elec. Trans. Ltd.	2½	2½	96		2 12 1
London & Home Counties 1955-75	4½	4½	109		4 2 7
Lond. Pass. Trans.:					
A	4½	4½	112⅓		4 0 0
B	5	5	114½		4 7 4
C	3	2⅞	45xd		6 7 9
West Midlands J.E.A. 1948–68	5	5	110		4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110		5 9 1
Def.	1½	1½	26		5 15 5
Anglo-Portuguese	8	8	18/9		8 10 8
Cable & Wireless:					
5½ Pref.	5½	5½	104	+1	5 6 9
Ord.	4	4	60	−1	6 13 4
Canadian Marconi $1	Nil	4cts.	5/–		3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	5*	27/6		3 12 9
Pref.	6	6	27/6		4 7 5
Great Northern Tel.: (£10)	Nil	Nil	15½		—
Inter. Tel. & Tel.	Nil	Nil	3		—
Marconi-Marine	7½	7½	28/9		5 4 4
Oriental Tel. Ord.	16	10	47/6		4 4 2
Telephone Props.	6	Nil	10/–		—
Tele. Rentals (5/–)	10	10	9/–		5 11 1
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	3/–	−2/-	—
4% Inc.	Nil	Nil	8½	−½	—
Brit. Elec. Traction:					
Def. Ord.	45	45	920		4 17 6
Pref. Ord.	8	8	170		4 14 2
Bristol Trams	8	10	46/3		4 6 4
Brazil Traction	$1	50c	16	+¼	—
Calcutta Trams	8	5½	18/3		6 0 9
Cape Elec. Trams	5	5	20/–		5 0 0
Lancs Transport	10	10	43/9		4 11 4
Mexican Light:					
1st Bonds	5	5	87½		5 14 3
Rio 5% Bonds	5	5	101		4 19 0
Southern Rly:					
5% Prefd.	5	5	65xd	−1	7 13 10
5% Pref.	5	5	106xd		4 14 6
T. Tilling	10	10	47/6		4 4 3
Tilling & B.A.	7*	6½*	55/–		2 7 3
West Riding	10	10	39/6		5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Aug. 4	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
					£ s. d.
Aron Elec. Ord. ..	Nil	7½	25/–	..	6 0 0
Assoc. Elec. :					
Ord.	10	10	45/9	..	4 7 6
Pref.	8	8	39/6	..	4 1 0
Automatic Tel.&El.	12½	12½	51/3	..	4 17 3
Babcock & Wilcox	11	11	42/–	..	5 4 9
British Aluminium	10	10	43/3	..	4 12 6
British Insul. Ord.	20	20	93/9	– 1/6	4 5 6
British Thermostat (5/–)	18½	18½	16/3	..	5 13 10
British Vac. Cleaner (5/–)	12½	10	13/9	..	3 12 9
Brush Ord. (5/–) ..	Nil	6	6/–	+3d.	5 0 0
Callender's ..	15	15	72/6	..	4 2 9
ChlorideElec.Storage	15	15	72/6	..	4 2 9
Cole, E. K. (5/–) ..	Nil	7	14/–	+6d.	2 10 0
Consolidated Signal	17	17	72/6	..	4 3 8
Crabtree (10/-) ..	17½	17½	30/–	..	5 16 8
Crompton Parkinson Ord. (5/–) ..	30	20	21/3	..	4 14 0
E.M.I. (10/–) ..	Nil	6	16/9	..	3 11 10
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	53/9	..	4 13 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	41/3	..	4 17 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	22°	20°	41/3	..	2 8 6
Ever Ready (5/–)	40	40	32/3	..	6 4 0
Falk Stadelmann	7	7½	23/9	..	6 6 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C. :					
Pref.	6½	6½	33/9	+ 1/6	3 17 0
Ord.	20	17½	80/–	..	4 7 6
Greenwood & Batley	15	15	30/–	..	10 0 0
Hall Telephone(10/–)	10	12½	20/–	..	6 5 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6	..	4 0 0
Hopkinsons ..	15	15	50/–	..	6 0 0
India Rubber Pref.	5½	5½	18/9	..	5 17 6
Intl. Combustion..	32½	30	107/6	..	5 12 0
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	68/9	..	5 16 4
Laurence, Scott (5/–)	15	12½	9/6	..	6 11 7
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	66/3	..	4 10 8
Mather & Platt ..	10	10	41/3	..	4 17 0
Met.Elec.Cable Pref.	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	..	4 2 0
Pye Deferred (5/–)	25	25	16/3	+3d.	7 13 10
Revo (10/–) ..	20	17½	28/9	..	6 1 9
Reyrolle	12½	12½	58/9	..	4 5 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)	2	4	4/6	..	4 9 0
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	43/9	..	4 11 4
Telephone Mfg.(5/–)	9	9	9/3	..	4 17 3
Thorn Elec. (5/–)	20	20	15/–	..	6 13 4
Tube Investments	23¾	20	85/–	..	4 14 1
Vactric (5/–) ..	Nil	Nil	6/–	..	—
Vickers (10/–) ..	10	10	16/9	+3d.	5 19 5
Ward & Goldstone (5/–)	20	20	19/–	+6d.	5 5 3
Westinghouse Brake	10	10	47/6	..	4 4 2
Walsall Conduits(4/–)	55	55	36/3	..	6 4 6
West, Allen (5/–)	7½	7½	5/9	..	6 10 5

° Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 189)

In the heavy industries group, Vickers at 16s. 9d. have added a few points to their price. Cable and Wireless preference at 104 is up 1; the ordinary at 60 is 1 down. Para Electric 6 per cent. debenture stock has come to notice at about 32. A little buying was stimulated by the more favourable prospects before Brazilian undertakings, and by the hope, rather than the expectation, that the company may be able to make some sort of distribution on these debentures in the near future.

Stock on Offer

Telephone & General Trust 7 per cent preference shares are available, as to a thousand shares, at 28s., returning at that price 5 per cent. on the money. United River Plate Telephone preference came on offer in a fairly large line at 22s. 3d., returning £4 18s. 10d. and a few Automatic Telephone sevens are available at 32s. 4½d. to pay £4 6s. 6d. For a higher yield, Anglo-American Telegraph 6 per cent. preferred stock at 111 makes a useful example, paying at that price £5 8s. 0d. per cent. The dividend service of the stock is well protected, but the dividend is not cumulative.

Three Years' Prices

It is interesting to compare some of to-day's prices of shares in the manufacturing group with those which were current just before the outbreak of war in September, 1939. Here is a short list :—

Ordinary	Aug. 31st, 1939 s.	d.	Now s.	d.	Rise s.	d.
Automatic Tel. ..	42	6	51	3	8	9
British Insulated	83	0	93	9	10	9
Callender's ..	61	0	72	6	11	6
Crompton ..	18	3	21	3	3	0
Enfield Cable ..	48	9	53	9	5	0
Ericsson	41	3	41	3	—	
Henley's	18	0	22	6	4	6
Johnson & Phillips	38	0	60	0	22	0
Siemens	21	0	26	3	5	3
Tel. Construction	38	0	43	9	5	9
Tel. Mfg. ..	8	6	9	3	0	9

This all-round improvement after nearly three years of such a war, is explainable only by reference to the consistent financial policy of the Government.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1940

8596. "Sound-recording systems." Radio Corporation of America. June 26th, 1939. (546332.)

15306. "Frame antenna arrangement." K. H. Meier. June 26th, 1939. (Divided out of 532164.) (546409.)

16160. "Radio testing apparatus." Murphy Radio, Ltd., J. E. Marshall, S. H. Cohen, H. G. T. Bissmire, L. Driscoll and A. H. Beattie. November 6th, 1940. (546336.)

17125. "Reception or transmission of sound waves." T. J. R. Bright and R. C. Ford. December 2nd, 1940. (Cognate application 17131/40.) (546338.)

17396. "Flexible conduit, suitable for use with electric wires and cables." R. H. Streete and R. Goldsmith. December 6th, 1940. (546339.)

1941

115. "Directional radio beacons." Aga-Baltic Radio Aktiebolag. January 4th, 1940. (546341.)

157. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., T. P. Preist and G. W. Thompson. January 4th, 1941. (546304.)

235. "Ultra-high-frequency circuits." Standard Telephones & Cables, Ltd., and C. H. Foulkes. January 7th, 1941. (546415.)

914. "Insulation of electric cables." Pirelli-General Cable Works, Ltd., B. O. Ashford and H. Barron. January 23rd, 1941. (546418.)

915. "Manufacture of electric conductors insulated with thermoplastic insulating materials." Pirelli-General Cable Works, Ltd., H. Barron and B. O. Ashford. January 23rd, 1941. (546419.)

1282. "Electric resistance welding apparatus." British Insulated Cables, Ltd., and L. B. Wilson. January 31st, 1941. (546390.)

1980. "Oscillator systems." Farnsworth Television & Radio Corporation. September 26th, 1940. (546363.)

2220. "Cathode-ray tube systems for generating image signals." Hazeltine Corporation. January 19th, 1940. (546305.)

2374. "Coil-loaded circuit." Standard Telephones & Cables, Ltd. February 24th, 1940. (546393.)

3505. "Glass coatings." Westinghouse Electric International Co. March 16th, 1940. (546357.)

3535. "Sound recording apparatus." Radio Corporation of America. March 30th, 1940. (546395.)

4189. "Electric cables." Pirelli-General Cable Works, Ltd., H. Barron and B. O. Ashford. March 28th, 1941. (546396.)

4540. "Photographic sound recorders." Radio Corporation of America. April 4th, 1940. (546308.)

4900. "Switch frogs for the overhead conductors of electric traction systems." British Insulated Cables, Ltd., London Passenger Transport Board, T. C. Broom and H. J. Powell. April 15th, 1941. (546311.)

4990. "Thermostatic control devices." British Thomson-Houston Co., Ltd. April 17th, 1940. (546312.)

5345. "Reduction of surface reflection." British Thomson-Houston Co., Ltd. April 26th, 1940. (546366.)

5415. "Trail frogs for overhead electric traction systems." British Insulated Cables, Ltd., London Passenger Transport Board, J. Holland and T. C. Broom. April 26th, 1941. (Cognate application, 7004/41.) (546314.)

6413. "Centrifugally operated electric switches." Howard & Bullough, Ltd., and E. J. Airey. May 19th, 1941. (546422.)

6427. "Piezo-electric circuits." Marconi's Wireless Telegraph Co., Ltd. May 18th, 1940. (546319.)

7262. "Electric compressed-air blow-out switches." Allmanna Svenska Elektriska Aktiebolaget. June 7th, 1940. (546399.)

7941. "Refractory melting pots, and method of preparing the same." British Thomson-Houston Co., Ltd. June 26th, 1940. (546371.)

8473. "Condition-responsive electric control switches." British Thomson-Houston Co., Ltd. July 5th, 1940. (546425.)

8979. "Frequency modulation television signal receiver." Hazeltine Corporation. August 2nd, 1940. (546323.)

10447. "Variable rating dynamo-electric machines." British Thomson-Houston Co., Ltd. August 17th, 1940. (546325.)

10783. "Electric-discharge tubes." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). August 23rd, 1941. (546376.)

13373. "Electric regulating switches for transformers." Asea Electric, Ltd., and A. Schaanning. October 17th, 1941. (546327.)

14380. "Lighting fixtures." British Thomson-Houston Co., Ltd. November 9th, 1940. (546379.)

1942

2228. "Electro-magnetic switches." Igranic Electric Co., Ltd. February 27th, 1941. (546404.)

Works Visit

THE London Students' Section of the Institution of Electrical Engineers has arranged a visit to the works of the Fuller Electrical & Manufacturing Co., Ltd., Walthamstow, on Saturday, September 5th. The party will meet at the factory by 1.30 p.m. and Messrs. Fuller have kindly arranged for lunch to be provided in their canteen. The visit is limited to a maximum of fifty members and those wishing to attend should advise Mr. W. Bolton, 114, Arcadian Gardens, Wood Green, N.22, as soon as possible.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

East Riding.—August 31st. County Education Committee. Electric lighting and heating installations in 40 air-raid shelters. Specifications from county architect, County Hall, Beverley. Tenders to Clerk of Council.

Normanton.—August 31st. Urban District Council. One 2-ton electric vehicle complete with battery charger (July 31st.).

Orders Placed

Durham.—County Council. Accepted. Electric lamps for the Shire Hall, detached offices and Assize Courts for twelve months.—Luxram Electric, Ltd.

Liverpool.—Electric Power and Lighting Committee. Accepted. Four kiosk substations with ring main units (£1,599).—Long & Crawford, Ltd. Two kiosk substations with four panel switchboards (£1,780).—Metropolitan-Vickers.

Salford.—Light and Heat and Power Committee. Accepted. Two scraper chains for wet ash conveyors (£1,440).—Robert Dempster & Sons.

South Shields.—Corporation. Accepted. Rewiring of the operating theatre at General Hospital and providing night lighting in the hospital wards (£153).—Law and Burns.

Warrington.—Corporation. Accepted. Annual supplies for Electricity Committee. Cables.—British Insulated Cables. Conduits.—H. J. Baldwin & Co. Cable covers.—Doulton & Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyne.—Kitchen waste department and concentrator plant (£4,000); A. T. Kemp, borough surveyor, Municipal Offices.

Batley.—Works canteen, Blakeridge Woollen Mills; S. Naylor, architect, J. T. & J. Taylor, Ltd., woollen manufacturers, Station Road.

Bingley.—Adaptation of three-storey building, Chapel, as new headquarters; secretary, Y.M.C.A., Quaker Hill, Bingley, Yorks.

Birkenhead. — A.R.P. buildings (£1,288); borough engineer.

Factory alterations; Fawcett, Preston & Co., Ltd.

Birmingham.—Decontamination laundries (£1,356) and nine restaurants (£10,415); city engineer.

Blaydon (Co. Durham).—Miners' canteen at Blaydon Burn Colliery; Hetherington & Wilson, County Chambers, Newcastle-on-Tyne.

Brighouse.—Works additions; Walker Bros., Ltd., haulage contractors, Atlas Mill Road.

Day nursery, Southowram (£1,448); J. B. Brooke & Sons, Ltd., 264, Manchester Road, Huddersfield.

Burradon (Northumberland).—British Restaurant; H. McNaught, surveyor, Council Offices, Forest Hall, Northumberland.

Chesterfield.—British Restaurant, St. Mary's Gate; W. S. Wilson, borough surveyor, Town Hall.

British Restaurant, Beighton; J. B. Wikeley, surveyor, Rural Council House, Chesterfield.

Coleshill (Warwickshire).—Additions to St. Edwards R.C. School; managers.

Darlington.—Canteen at Darlington Grammar School; E. Minors, borough engineer.

Denholme.—Houses; E. Hill, surveyor, Council Offices.

Derbyshire.—Council school; J. Harrison, county architect, County Offices, St. Mary's Gate, Derby.

Durham.—Wartime nurseries at Ferryhill (G. W. Lazenby & Co., Ltd., builders, Ferryhill), Houghton, Trimdon Colliery, Trimdon Grange, and Wheatley Hill; county surveyor, 43, Old Elvet, Durham.

Mechanical laboratory at Jarrow Secondary School (£970); county education architect, 34, Old Elvet, Durham.

Cleansing station at Birtley; J. Burnett & Son, builders, Birtley.

Gas cleansing stations; Lax & Sons, builders, Crook; and Gradon & Sons, builders, Durham.

Evesham.—Boys' club and institute; secretary, Youth Council, Municipal Offices.

Feltham.—Youth centre, Station Parade; U.D.C. surveyor.

Guildford.—Workshop; Warner Engineering Co., Ltd.

Hambledon.—Kitchen, Council offices; surveyor, Council Offices, Bury Fields, Guildford.

Hampshire.—Staff canteen, High Street, Winchester (£4,000) and eight school kitchens; county architect.

Kent.—Improvements to technical college, Erith (£2,000) and additions to Technical Institute, Tonbridge (£1,000); county architect, Maidstone.

Lancashire.—Temporary school, Droylsden (£2,850) and school nurseries at Barrowford, Litherland, Penketh and Urmston; county architect, Preston.

London.—LEWISHAM.—Convalescent home, Eliot Bank; Church of England Committee for Non-Aryan Christians.

ST. MARYLEBONE.—Rebuilding property in Oxford Street and Holles Street; John Lewis Properties, Ltd.

Manchester.—Partial rebuilding of Royal Eye Hospital, Oxford Road; governors.

Works at power station for E.C.; John Dickinson & Co. (Bolton), Ltd., Fairclough Street, Bolton.

Maryport.—British Restaurant; U.D.C. surveyor.

North Riding.—School kitchen at Northallerton (£970); J. R. White, county architect, Northallerton.

Northumberland.—Wartime nurseries at Alnwick and Prudhoe; lighting installations in shelters at Ashington and Gosforth; central kitchen at Hexham; school canteens at Westmoor and Burradon; and public shelters to accommodate 550 people at Whitley Bay and Monkseaton; county surveyor, Mitford Road Offices, Morpeth.

Nottinghamshire.—School kitchens (£10,000) ; county architect.

Rothbury (Northumberland).—Maternity wing at the Coquetdale Cottage Hospital, Rothbury.

Smethwick.—Nursery, Norman Road (£1,296) J. Harper & Sons, Ltd.

Southgate.—Nursery, Tottenhall (£1,394) ; Sir Lindsay Parkinson & Co., Ltd.

South Shields.—Extensions to dairy, Heugh Terrace, for Craven Dairies, Ltd.; F. W. Newby, architect, King Street.

Dairy extensions, Egerton Road, for F. H. White; R. Summerbell & Son, builders, Rutland Street.

Tottington.—Child welfare centre, public assistance office and school kitchen at Wellbank Street; L. Kenyon, surveyor, Town Hall, Tottington, near Bury, Lancs.

Tynemouth.—Workshop, Dene Terrace for Dryers, Ltd., sawmillers.

Wallasey.—School shelters, Church Street and Somerville (£2,840) ; H. Dodd.

Additions to Maternity Hospital (£10,000) ; borough engineer.

Warrington.—Central cooking depôt at Walton Hall; Wright Bros., builders, Victoria Road, Stockton Heath, Warrington.

West Riding.—Four dairies for bottling pasteurised milk (£100,000) ; county architect, Wakefield.

Wolverhampton.—Workshop ; P. A. Mudd & Co.

Worksop.—Remand home, Ashley House (£2,405) ; A. Mason (Contractors), Ltd., Mansfield.

Wythenshawe.—Additions to Co-operative Stores, Crossacres Road; Manchester & District Equitable Co-operative Society, Ltd., Downing Street, Ardwick, Manchester.

York.—Reinstatement of Tower Cinema, New Street ; Cinema Co.

Warehouse alterations, North Street ; H. Bushell & Sons.

Brazil's Power Needs

Signs of Abnormal Expansion

THE effects of the establishment of new industries in Brazil on the power situation are mentioned in the 1941 report of the Brazilian Traction, Light & Power Co., Ltd., which through its affiliated concerns controls the electricity supply in the cities of Rio de Janeiro, São Paulo and Santos.

The report states that the load on the Rio and São Paulo systems gives evidence of abnormally rapid growth which, if continued along the lines at present indicated, will be difficult to cope with under war conditions due to shortage of available materials. The matter is being actively discussed with the governing authorities in Brazil. One important factor contributing to the increasing demand is the service which, by order of the Brazilian National Council of Waters and Electrical Energy, the companies in Rio and São Paulo have been required to furnish to other supply companies operating in areas adjacent to those supplied by the Rio and São Paulo concerns, but which for one reason or another lack the power required by their own consumers. Another factor is that, due to conditions arising as a result of the war, a great impetus has been, and is still being, given to the establishment of new industries in Brazil in order to render the country more independent of outside supplies. In this connection the most noteworthy recent development is the large steel mill at Volta Redonda in the State of Rio on which work is proceeding, and which will call for the supply of a large quantity of electric power.

Particulars are given of the development of the Rio de Janeiro, São Paulo and Santos undertakings during last year. The report shows that the aggregate sales of electricity for lighting and power in the three areas amounted to 1,817 million kWh, as compared with 1,658 million kWh in the preceding year, an advance of 9.5 per cent. The number of consumers increased during the twelve months from 561,868 to 591,935, the capacity of the generating plants from 554,234 kW to 556,509 kW and the total connected load from 1,202,809 kW to 1,286,890 kW.

The capacity of the transforming plant of the joint undertakings was increased to the extent of 51,618 kVA, bringing the aggregate up to 1,610,828 kVA, and 41 miles was added to the transmission system, making the total length of lines in operation 2,052 miles. Distribution is mostly overhead (31,063 miles), extensions during the year amounting to 1,330 miles.

Slow but steady progress was made with the new Retiro structure near the confluence of the canal with the Tiete River. The modernisation of the Lages plant serving the Rio de Janeiro system was retarded by difficulties in obtaining delivery of equipment. Some parts of the second unit of 35,000 kW delivered in an unfinished condition were subsequently satisfactorily completed in the company's own workshops in Rio despite the fact that the work was on a scale beyond anything previously attempted in Brazil. The new unit was expected to be ready for operation in June.

Full details are given in this technical booklet, a copy of which will gladly be sent on request.

MALLORY 73

BERYLLIUM COPPER

for ELECTRICAL *and* INSTRUMENT SPRINGS

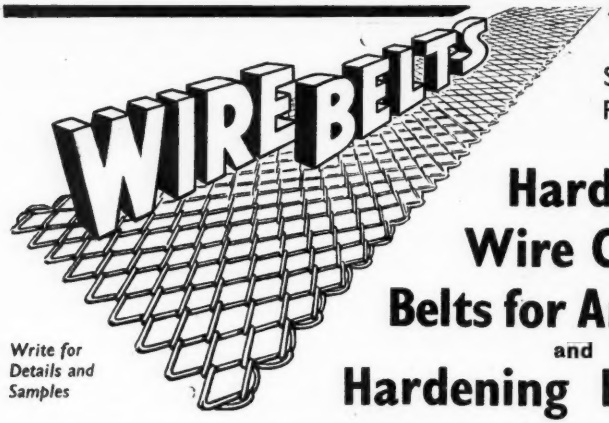
AVAILABLE in the form of strip and wire, possesses tensile and fatigue properties greater than those of any other non-ferrous alloy: a conductivity higher than that of any of the bronzes, and high resistance to corrosion and wear. It can be formed to shape in the soft state, after which a short heat treatment process develops maximum spring properties. Mallory 73 Beryllium Copper is now meeting many demands for an exceptionally heavy duty material in current-carrying springs, snap action switch blades, contact blades and clips, and instrument springs and diaphragms.

MALLORY

MALLORY METALLURGICAL PRODUCTS LTD. *(An associate company of Johnson, Matthey & Co. Ltd.)*
78 Hatton Garden, London, E.C.1 *Telephone : HOLborn 6989*

GD17
D

PYROTENAX LTD. • • HEBBURN • • CO. DURHAM



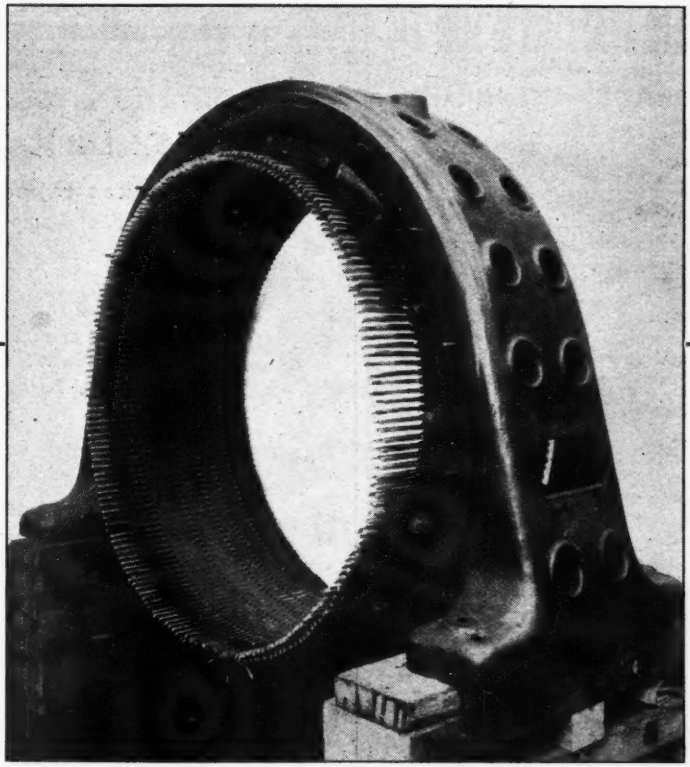
STRONG & RELIABLE

Hardwearing Wire Conveyor Belts for Annealing and Hardening Furnaces

Sorting, Quenching, Handling, Elevating, etc.

Write for Details and Samples

The BRITISH WEDGE WIRE Co. Ltd.
WARRINGTON ENGLAND
Telephone. WARRINGTON 663 *Telegrams.* CUNEIFORM WARRINGTON



REWINDING A LARGE STATOR AT OUR WORKS

For reliable and guaranteed repairs or rewinds you cannot do better than get in touch with us.

WE COLLECT AND DELIVER

Electrical Power Repairs (Gillingham) Ltd.

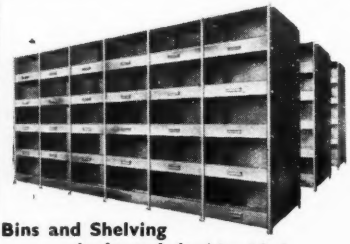
STROVER STREET, GILLINGHAM, KENT

Telephone No.: Gillingham 5200

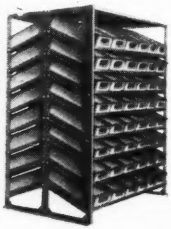
AUSTIN WALTERS & SON LTD.

MANUFACTURERS OF

STORAGE EQUIPMENT

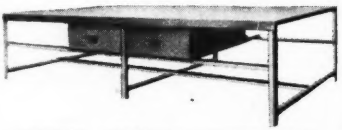


Bins and Shelving
single and double-sided



STORAGE RACKS
for
Small Parts
Removable Trays

TOOL CABINETS
39" × 18" × 15"
Lock and Key
FROM STOCK



STEEL WORK BENCHES
8' 0" × 3' 0" × 2' 8"
Two Drawers with Lock and Key

AUSTIN WALTERS & SON LTD.
Old Trafford, MANCHESTER 16

This is the System that Wylex Built

15 amp. Socket takes
3 Plug Tops, 15, 5, or 2 amp.

15 amp. Socket with 15 amp. Dual Plug.

The same 15 amp. Socket with 5 amp. Fuse Plug.

The same 15 amp. Socket with 2 amp. Fuse Plug.

DIRECT PLUGGING NO ADAPTORS

Can only be done with the Flat Pin Wylex Fuse Plug System.

MILLIONS IN USE

WYLEX

GEORGE H. SCHOLES & Co. Ltd.
Wylex Works, Wythenshawe,
MANCHESTER.

N4

E.L.M.A.

RETURN AND RE-USE OF PACKING MATERIAL

★ **BULK LAMP CONTAINERS are munitions of war and if preserved in good condition can be used again, thus making a substantial saving in labour and material.**

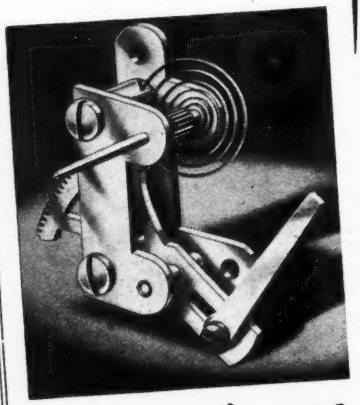
★ **ALL BULK CONTAINERS should be returned to the nearest depot of any E.L.M.A. Member, or, if there is a van delivery service operated by an E.L.M.A. Member in your district, hand them to the carman.**

★ ★ ★

Issued by the Electric Lamp Manufacturers Association

MOVEMENTS
FOR
VACUUM & PRESSURE GAUGES

Rotherham clockwork recording and synchronous mechanisms are built up to the highest standards of accuracy. Their precision and reliability are the result of a tradition which has been rigidly adhered to since Rotherhams first made watches in 1750.

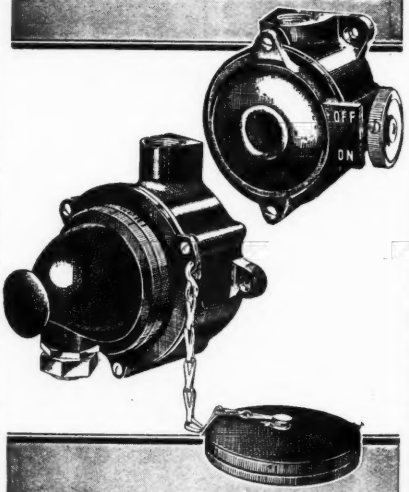


Rotherhams OF COVENTRY

ROTHERHAM & SONS LTD.
COVENTRY. Tele.: 4154
PRECISION MANUFACTURERS SINCE 1750

MK

SYMBOLIC SINCE 1919



ORIGINALITY IN DESIGN...
FIRST CLASS WORKMANSHIP
AND
GOOD SERVICE

M.K.ELECTRIC LTD.
WAKEFIELD ST... EDMONTON N.18.
Telephone: Tottenham 5151. Telegrams: Multiconta, Southtot London

M.K. 151A

"QUACK" "QUACK"

(The following testimonial to Desoutter Tools is not only unsolicited but utterly untrue. The characters in it refer to no living person and indeed the whole thing is a complete invention).

"Sir, I work in an aeroplane factory and spend most of my day drilling holes. I found my work very boring, Sir. The constant effort of lifting the heavy power drill, Sir, and holding it steady in position gave me pains in my wrists and arms, Sir, and also pains in my shoulders and a pain in the small of my back, Sir. I frequently groaned at my work, Sir, and my mates then said that I gave them a pain in the neck. I grew very depressed and so did my chargehand.

At last one day a friend advised me to try a certain Drill that he knew, Sir. He said it was much lighter and easier to handle. So I persuaded my chargehand (a kindhearted man, Sir) to get me one of them Dusuetter, Dosooter, Dusouetir—to get me one of your drills, Sir, and Oh! Sir, what a difference. All my aches and pains have gone. I now do twice the work in half the time and instead of groaning I sing. My workmates now complain that I give them a pain in the ear.

Yours gratefully,

I. B. A. Newman (Mr.)"

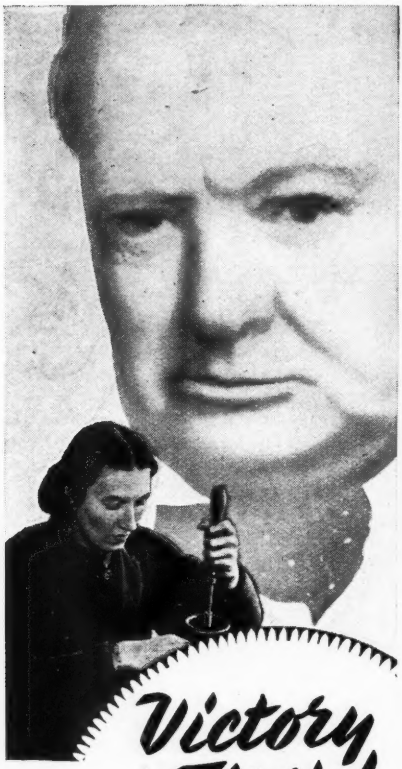
R.2/45. ¼" Rotor Drill. Chuck speed. 4,500 r.p.m. Similar models and speeds of 13,000, 2,100, 1,500, 1,000 or 750 r.p.m. are available. Straight case supplied instead of pistol grip if desired.

DESOUTTER

Specialists in Lightweight Pneumatic & Electric Portable Tools.

DRILL GUNS · SCREWDRIVERS · NUTRUNNERS · SHEARS · GRINDERS · COUNTERSINKING TOOLS · BOLT MILLING TOOLS · DESOUTTER BROS. LTD., DEPT. R, THE HYDE, HENDON, LONDON, N.W.9. PHONE: COLINDALE 6346-7-8-9, GRAMS: DESPNUCO, HYDE, LONDON. WORLD-WIDE REPRESENTATION.

C.R.C.127



Victory First!

'Austerity' is the watchword for the peoples of the United Nations. In sacrificing luxuries and even former necessities we enable our resources to be more rapidly mobilised for the defeat of the Axis powers. When the better things of life once more become available those most entitled to their enjoyment are the millions now fighting and toiling for Victory!

A Tribute to the War-Workers of the Nation.

ELEXCEL LTD. LONDON & LIVERPOOL

Makers of XCEL *Electric Cookers*

MAKERS OF ALL TYPES OF

SYNTHETIC RESIN PAPERS

FOR THE MANUFACTURE OF LAMINATED SHEETS AND TUBES

IMPREGNATED AND COATED

BUTTERFLY BRAND

SAMUEL JONES & Co. LTD.

16/17 NEW BRIDGE ST. EC4 CENTRAL 6500

CONDUIT

BRASS ADAPTORS

for

FLEXIBLE METALLIC TUBE

These fittings are available with or without grub screws.

The range covers standard bores and conduit sizes.

Those with grub screws can be supplied female or male Conduit.

ALL SIZES OF BRASS BUSHES, EARTH CLIPS, CONDUIT FITTINGS.

METWAY PRODUCTS

Stocked by leading Wholesalers

For details ask for List No. 8541/E.R.

METROPOLITAN ELECTRIC SUPPLIES

Sole Proprietor: D. G. E. BARRIE

Metway Works, King St., Brighton

Phone: Brighton 4456. Grams: "Metway, Phone, Brighton"

IGRANIC
Electric Control Gear

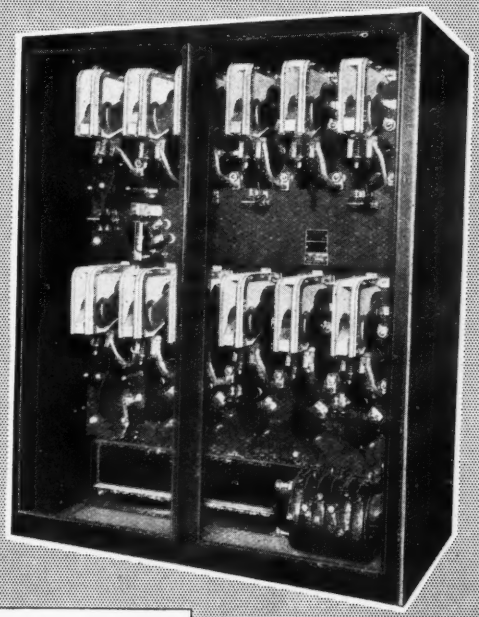
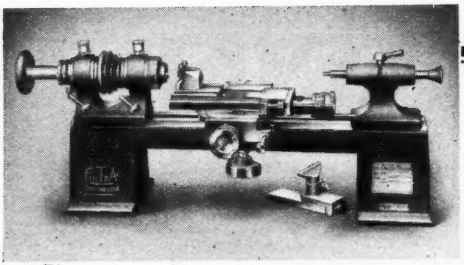


Illustration shows Igranic Panel for Control of 25-Ton High-Speed Main Hoist Dogging Crane

BEDFORD
IGRANIC
ELECTRIC Co Ltd
LONDON

For
EFFICIENT PROTECTION
of Valuable Machinery and for
RELIABILITY specify
IGRANIC CONTROL
A TYPE FOR EVERY DUTY AND SERVICE



NEW MODEL

CU-45

Superseding Model 241/12

PULTRA MANCHESTER

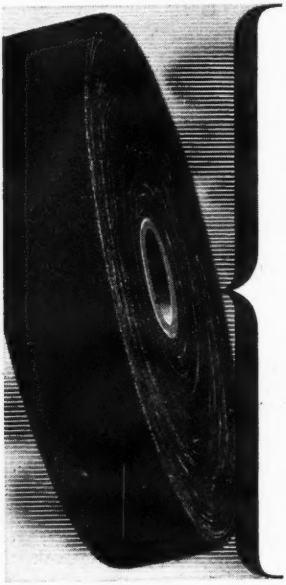
SMALL PRECISION LATHES

British Made to highest International Standards

A Range of New Constructions with many improvements and unique features

PULTRA LIMITED ENGINEERING SPECIALISTS

24 GRAVEL LANE, SALFORD, MANCHESTER



CONNOLLY'S

Adhesive Tape

Available in two grades—"Blackley" Adhesive Tape for the very best work where only the best will do. A really super tape. "Limpet" Adhesive Tape for the next best job where a high degree of quality is required but where price is an important consideration. One or other of these famous Adhesive Tapes will completely fill your requirements. "Blackley" or "Limpet" on every job.

CONNOLLY'S (BLACKLEY) LTD., MANCHESTER 9

Telephone: Cheetham Hill 1801 (3 lines)
Telegrams: "Connollys, Blackley."

London Office: **OSWALDESTRE HOUSE, STRAND, W.C.2**

Telephone: TEMple Bar 5506–7
Telegrams: "Syllonnoc, Estrand, London."

The little fellow that's lending
a BIG HAND!
B·A·C
PRODUCTS OF
TOOLROOM
ACCURACY
STANDARDISED
DRILL BUSHES
by
British Aero Components Ltd.
Hinckley.
Standardised Drill Bushes & Sodium Cooled Valves.

TUBES
CARTONS
OR ANY PAPER
OR CARDBOARD ARTICLE
WAXED OR UNWAXED

For essential components in the electrical engineering and aircraft industries, we can make early delivery of Pearlite cartons and tubes in waxed or unwaxed cardboard. These containers are ideal for storage purposes, or transport, as they are moisture-proof, rigid, strong and light. Pearlite products are not war-time substitutes—they represent a logical advance to better and more economical methods of packing. Your inquiries are invited.

Pearlite REGD
Strongly recommended for STRENGTH

Sole Manufacturers:
PEARLITE BOX CO. LTD.
HEAD OFFICE: WEST ROAD, LONDON, N.17
Telephone: TOTtenham 5051-2
FACTORIES AT LONDON AND MANCHESTER
Both fully equipped

THIS IS ONLY ONE OF THE MANY
CONDUIT FITTINGS

IN

ARBAL BRAND

Details of the full range can be obtained from any Wholesaler.

HARTLEY & BALDWIN LTD.
TOWER CHAMBERS, CHURCH GATE
LEICESTER

The Usual Standard isn't enough

We can supply you with
FIBRE JOINTS AND WASHERS
OF GUARANTEED ACCURACY

ALSO "Corrujoint" All-Metal Gasket, Taylor's Corrugated Packing, Copper Joints and Washers, Compressed Asbestos Jointings, Shims, and Kinghorn Type Metallic Valves, tabwashers to specifications.
Write for Brochure

THE CORRUGATED PACKING AND SHEET METAL CO. LTD.
GATESHEAD-ON-TYNE
PHONE: GATESHEAD 71785. GRAMS: CORRUJOINT GATESHEAD.

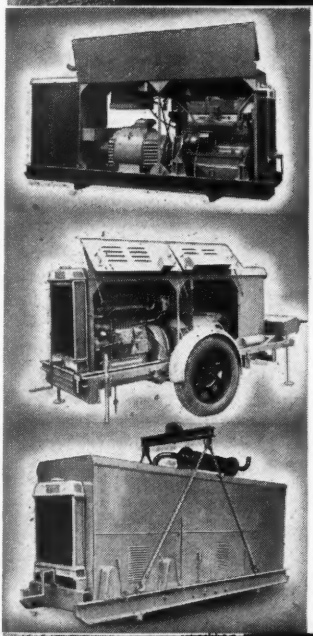
PERKINS DIESEL ELECTRIC DATA · No.4

PERKINS

DIESELS AND ELECTRIC PLANT

FOR STATIONARY, PORTABLE AND MARINE APPLICATIONS

Hand or Automatically Controlled



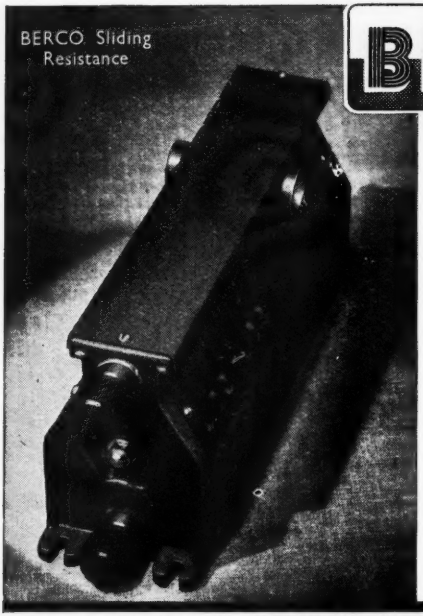
TRANSPORTABLE SELF-CONTAINED GENERATING UNITS

1. Compact, self-contained Generating Units, up to 50 kW, D.C. or A.C., ready for use in any location.
2. Complete with radiator cooling, fuel tank and filtering equipment, electric starting, main generator control and output switchboard.
3. All assembled with cold starting Perkins Diesel Engine on substantial sub-frame, with efficient protecting screening.
4. *Trailer Sets* arranged for towing, with all the necessary safeguards.
5. *Transportable Sets* arranged with substantial lifting eyes and supplied with chains and spreader for lifting by crane. Fixed rollers are optional on these sets.
6. No special foundations necessary.

PERKINS STATIONARY DIESELS

Built to run at twice their Industrial Speed and double their continuous output.

TELEPHONE: PETERBOROUGH 3241



BERCO

RESISTANCES

Although present circumstances render it difficult for us to give our pre-war service to all customers, we are still working in their interests.

New materials and manufacturing processes which we are now using to increase output also contribute in large measure to improved performance and reliability of our products. Thus, when normal times return, all users of Berco Resistances will benefit by our work to-day.

THE BRITISH ELECTRIC RESISTANCE CO. LTD.
QUEENSWAY, PONDERS END, MIDDLESEX

Telephone : HOWARD 1492
Telegrams : "VITROHM, ENFIELD"

R.

TENAPLAS

EXTRUDED PLASTICS

Specialised knowledge in the extrusion of plastics guarantees the technical excellence of Tenaplas Products. Although mainly used at the present time for Chemical and Electrical Insulation the Tenaplas Process of extrusion can be utilised with great advantage in many other branches of industry.

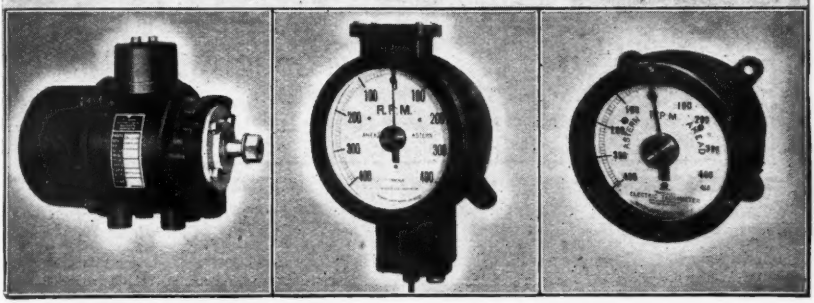
Our service is at the disposal of all manufacturers interested.

TENAPLAS LTD. Head Office, **7 PARK LANE, LONDON, W.1.**

ROBUST ACCURATE & RELIABLE

RECORD

'CIRSCALE' Electric type TACHOMETERS



D.C. GENERATOR TRANSMITTER made in two types. Industrial and Watertight as required. Two or more indicators can be operated from the one Transmitter.

MARINE PATTERN INDICATOR in Admiralty bronze watertight case with terminal box and fixing lugs. Illuminated dial also supplied, for use on the bridge of a ship.

MARINE PATTERN INDICATOR in dust and splash proof case, for wall or panel mounting. Illustration shows centre zero instrument for use as combined directional and speed indicator.

THE RECORD ELECTRICAL COMPANY LTD.

BROADHEATH · ALTRINCHAM · CHESHIRE.

LONDON OFFICE:- 28, VICTORIA STREET, WESTMINSTER, S.W.1.

Telegrams: "Patella, Sedist, London." Telephone: Hop 0594 (3 lines).

CABLE

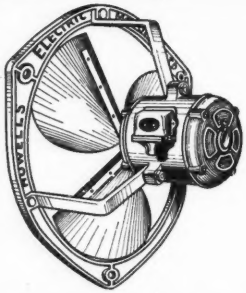
V.I.R. Braided, Lead Covered, T.R. Sheathed CABLES, STARTERS, SWITCHGEAR, "RAPPER" Tools, "QUEAD" Dimmers.

ALL MANUFACTURED BY US IN LONDON

WILLIAM GEIPEL LTD. Head Office: 156-170 Bermondsey Street, LONDON, S.E.1
Cable Works: WEMBLEY, MIDDLESEX.

HOWELLS (ELECTRIC MOTORS) LTD.

VALE PLACE WORKS, HANLEY, STAFFS.



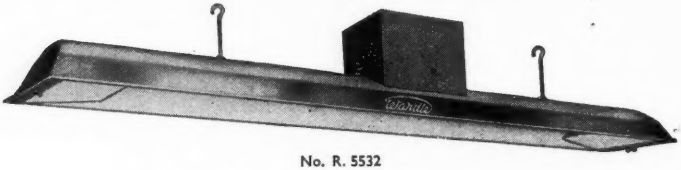
ANOTHER

"HOWELLS"

PRODUCT

LONDON : Palmers Green 5428.
MANCHESTER : Didsbury 4709.
BIRMINGHAM : Central 7909.
STOKE-on-TRENT 29624.
BRISTOL 43409.

WARDLE "TRAFFORD" REFLECTORS



No. R. 5532

For use with 80-watt, 5-ft. Fluorescent Tubes.
Heavy gauge sheet steel. Standard finish, glossy enamel.
Chain or tube suspension. With or without gear box.

Write for Publication No. R. 588.

WARDLE ENGINEERING CO. LTD.
OLD TRAFFORD, MANCHESTER, 16
London - 34 VICTORIA STREET, S.W.1

BRITANNIC CABLES

AN INDEPENDENT COMPANY, MAKERS OF E.H.T.
AND L.T. PAPER MAINS CABLES, VARNISHED CAMBRIC
C.T.S. MINING TRAILING, "IVERITE" INSULATED CABLES

BRITANNIC ELECTRIC CABLE & CONSTRUCTION CO. LTD. IVER, BUCKS
Telephone: IVER 491 Telegrams "BRITANNIC, IVER"

MOTOR CONTROL GEAR

A.C. — D.C.
INDUSTRIAL — FLAMEPROOF
HAND OPERATED or AUTOMATIC

The A.C. Types have
Protection against Single Phasing

THE ELECTRICAL APPARATUS CO. LTD.
NEW BARNES AVENUE ST. ALBANS

TWO 2,750 K.W.
TURBO ALTERNATORS
FOR IMMEDIATE DISPOSAL

2,750 K.W. TURBO ALTERNATOR (by Lancashire Dynamo & Motor Co. Ltd.) Belliss & Morcom Ltd., 410 volts, 4,850 amps. 3,437 K.V.A., 3,000 r.p.m. 3-phase, 50 cycles, size TA.640 No. 77595, with exciter 130 volts, 240 amps., 31 K.W., 3,000 r.p.m. shunt wound, size 7½, No. 77587, Steam Turbine, by Belliss & Morcom, Ltd., No. 406 usual pressure gauges and fittings, Flowmeter, Steam Strainer, Aria Automatic Regulator, two Cambridge Index Thermometers, Cambridge Pyrometer, for 335-lbs. steam pressure at 650 degrees superheat. Surface Condenser 8ft. 3in. long between tube plates × 4ft. 9in. diameter, having approximately 1,564 tubes 8ft. 3in. long × ¾in. diameter or approximately 2,800 square feet of cooling surface, oil cooler and tank, Air Cooler by Heenan & Froude Ltd., Air Pump driven by 6 B.H.P. Motor by Crypto, 410 volts, 3-phase, 50 cycles, E.V.S.C. 10 amps., 1,420 r.p.m. Size SK. No. 18v82 complete with Ellison Push Button Starter, No. A65617, Memlock Switch, usual interconnecting pipes and fittings. At Lowestoft. DITTO. Turbine No. 407, Alternator 77586, Exciter No. 77588, Pump No. 18v8L Starter No. A65617. At Lowestoft

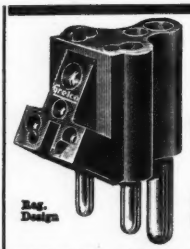
THOS. W. WARD LTD.
ALBION WORKS • SHEFFIELD
Phone: 26311 (15 lines). Grams: "Forward, Sheffield."

WORTHINGTON - SIMPSON

Condensing Plants for Main Power Stations.–Surface Condensers–Latest Double Folded Tube Layer Design, giving Oxygen Free Condensate at Vacuum Temperature.

Circulating and Extraction Pumps.
Steam Jet Air Ejectors.
Closed Feed Systems.
Heaters. — Evaporators.
Automatic High Pressure Bye-pass Valves (Patent applied for).
De - aerators.
Boiler Feed Pumps.
Automatic Exhaust Relief Valves.
A COMPLETE SERVICE.

WORTHINGTON - SIMPSON LTD.
NEWARK-ON-TRENT.



Grelco
MULTI-PLUG ADAPTORS
ELEVEN TYPES
Fully illustrated descriptive folder on application
Phone: Molesey 3000-1
GRELCO Ltd., 91-93 Stanley Road, Teddington, Middx.

DURAWIRE YOUR ELECTRICAL WORK AND BE SURE

MODERN DEVELOPMENTS	IN SYNTHETIC CHEMISTRY
Duratwinflex "S"	and all standard sizes in single wires and flexes as Durawire "S"
Durathreeflex "S"	
Duratwinflat "SS"	
Durathreeflat "SS"	
Duracables	

DURATUBE & WIRE, LTD. Telephone: FELtham 3332
FAGGS ROAD, FELTHAM, MIDDLESEX.

Legg
MANUFACTURING ELECTRICAL ENGINEERS
LEGG (Industries) LTD., WILLIAMSON ST., WOLVERHAMPTON
M-W. 77

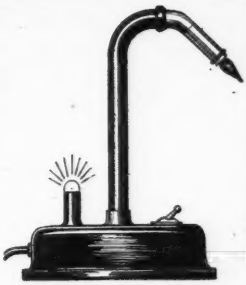
More is required for protection than merely a detachable device to hold the fuse wire in circuit. The SLYDLOK Fuse is designed to meet the needs of to-day—questions of vibration, neglect, space, identification and adaptability are *all* answered by the SLYDLOK design.

SLYDLOK
VIBRATION-PROOF **FUSES**
Whilst producing to maximum capacity, orders can be dealt with in rotation.
EDWARD Wilcox & CO LTD
dm 679 Sharston Road, Wythenshawe, MANCHESTER

"ACRU"

STATIV SOLDERING IRON

Easily Interchangeable Copper Bits.
Switch. Neon-Indicator-Lamp.
8 Different Copper Bits available.
Air-tight Element.
100 W, 150 W, 250 W.
DELIVERY FROM STOCK.



Manufactured by:
THE ACRU ELECTRIC TOOL MANUFACTURING CO. LTD.
123 HYDE ROAD · ARDWICK · MANCHESTER *Telephone: Ardwick 4284*
London Agents: OUGREE STEEL TRADING CO. LTD., LONDON, E.C.2. *Telephone: Bishopsgate 5951-5*

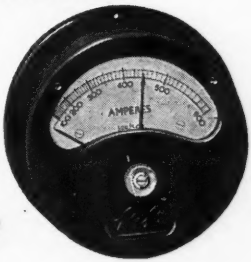
P+B

LONG SCALE LOAD INDICATOR

TELLS THE LOAD PAST & PRESENT

TIME LAG
10, 15, 20 or 30
MINUTES

WIDELY
USED
IN
SUBSTATIONS



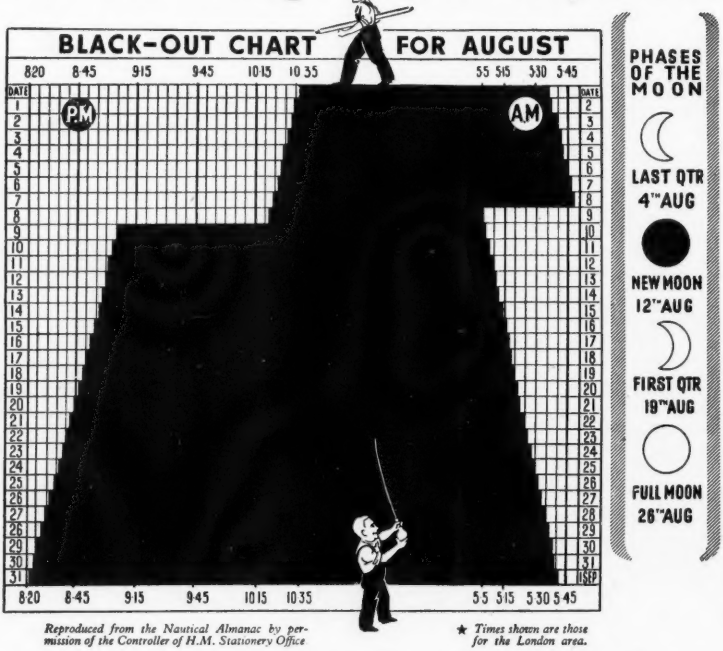
PRICE & BELSHAM LTD
MAKERS OF MAXIMUM DEMAND INDICATORS
TAMWORTH LANE WORKS, MITCHAM, SURREY

CREOSOTED POLES

for
POWER LINES
Telegraph Poles, Engineering and Constructional Timbers of Every Description.

BURT. BOULTON & HAYWOOD LTD.
BRETTENHAM HOUSE, WELLINGTON STREET, W.C.2
Telephone, Temple Bar 5801 (5 lines) Telegrams, Burboul, Rand, London
Depots: LONDON NEWPORT SOUTHAMPTON Etc.

Let the change remind you . . .



Reproduced from the Nautical Almanac by permission of the Controller of H.M. Stationery Office

★ *Times shown are those for the London area.*

In August, the extra hour of daylight is lost to the industrial war effort, and besides, black-out hours increase alarmingly with the shortening days. Preparations are being made for winter—lighting schemes adjusted to assist a still greater output, and Osram will continue to be the choice of all who demand of their lamps really dependable service under all conditions.

Osram

A G.E.C. PRODUCT

THE WONDERFUL LAMP

NATIONAL EMERGENCY.—*Please assist by saving all packing material for collection when our van calls.*